The Journal
OF THE KANSAS MEDICAL SOCIETY

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Meat and its applicability in the Dietary Management of Atherosclerosis

Contrary to the former belief that serum cholesterol levels are primarily related to ingested animal fat and consequently to dietary cholesterol, it now appears that the total amount of fat in the diet, not its source or cholesterol content, is a more important factor in determining the blood cholesterol concentration.[1,2,3,4] Clinical observation has shown that ingestion of vegetable fat—which contains no cholesterol—will, like fats of animal origin, raise the serum cholesterol level.[3, 5]

Recent basic research on the influence of fats and cholesterol on human health has done much to further progress in the fight against atherosclerosis. It will serve well in dispelling the mistaken fear that reasonable amounts of foods of animal origin predispose the individual to this vascular disease.[6] As a matter of fact, a dietary inadequate in essential nutrients but providing too many calories and too much fat from *any* source may well be an important factor underlying the deposition of fat and cholesterol in the arteries and liver.

Cumulative evidence indicates that lowered blood levels of cholesterol may be effected by restricting the total fat intake.[1] Except in instances of refractory hypercholesteremia, in which a daily fat intake as low as 10 Gm. may not reduce cholesterol levels to normal, diets containing 20 to 30 Gm. of fat, or even more, often produce low cholesterol blood levels. In the clinical application of this principle, various palatable, low fat diets which supply three servings of meat daily (containing 18 Gm. of fat) have recently been suggested for the dietary management of arteriosclerosis and for enlisting the cooperation of patients.[1] The meat servings were chosen from a large variety of cuts and kinds of meat (fat trimmed off, as lean as possible). Meat adds to the eating appeal of the fat-restricted diet and contributes important amounts of biologically complete protein, the B group of vitamins including B_{12}, and food iron—all of which are important for a good state of nutrition in the atherosclerotic patient.

1. Hildreth, E.A.; Hildreth, D.M., and Mellinkoff, S.M.: Principles of a Low Fat Diet, Circulation *4*:899 (Dec.) 1951.
2. Bloch, K.: The Intermediary Metabolism of Cholesterol, Circulation *1*:214 (Feb.) 1950.
3. Keys, A.; Mickelson, O.; Miller, E.V.O., and Chapman, L.B.: The Relation in Man Between Cholesterol Levels in the Diet and in the Blood, Science *112*:79, 1950.
4. Gubner, R., and Ungerleider, H.E.: Arteriosclerosis, a Statement of the Problem, Am. J. Med. *6*:60, 1949.
5. Hildreth, E.A.; Mellinkoff, S.M.; Blair, G.W., and Hildreth, D.M.: The Effect of Vegetable Fat Ingestion on Human Serum Cholesterol Concentration, Circulation *3*:641 (May) 1951.
6. King, C.G.: Trends in the Science of Food and Its Relation to Life and Health, Nutrition Rev. *10*:1 (Jan.) 1952.

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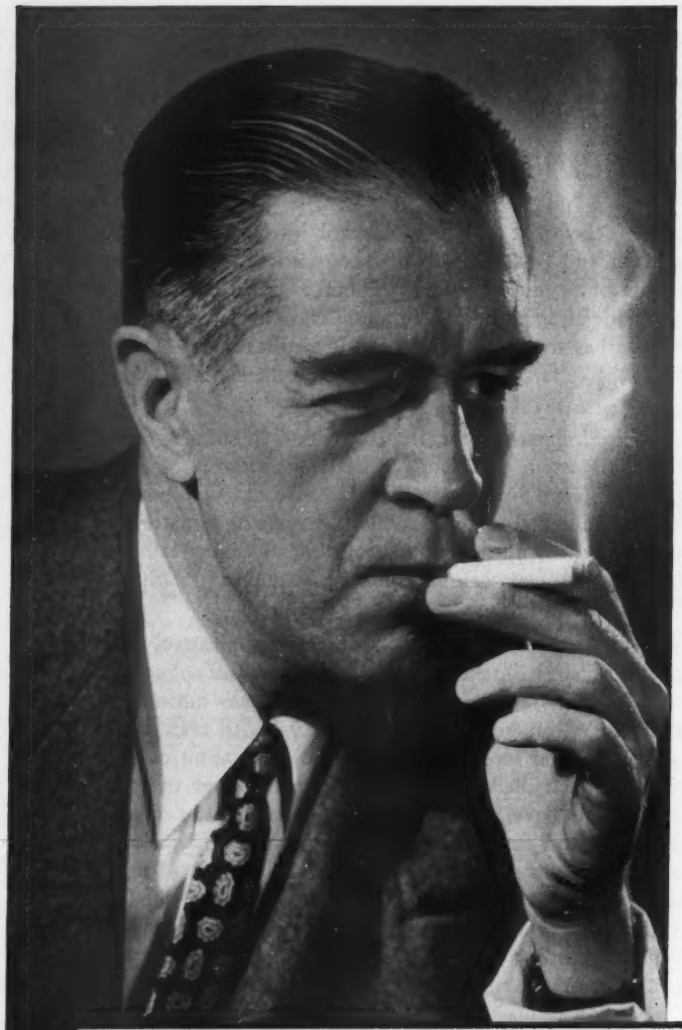

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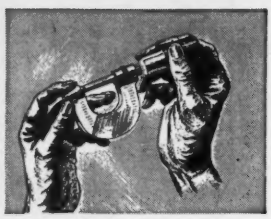

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Kaplan, H. S., and Rigler, L. R., Journal of Laboratory and Clinical Medicine, Vol. 32, No. 6, June, '47, p. 644 ff.

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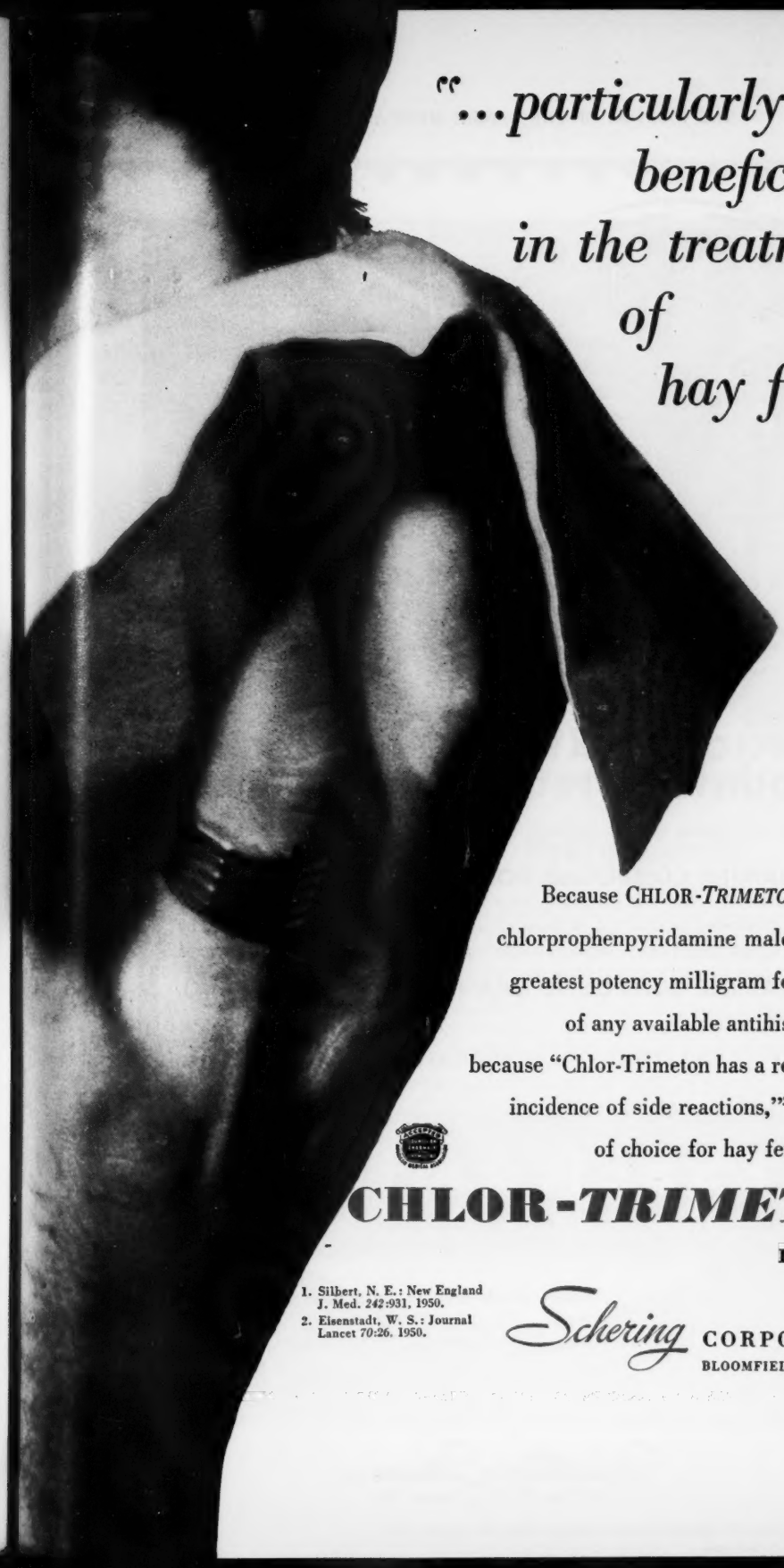

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1. Silbert, N. E.: New England J. Med. 242:931, 1950.
2. Eisenstadt, W. S.: Journal Lancet 70:26. 1950.

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*Matthews, J. G.: Care and Healing of Traumatic Wounds. *Northwest Med.*, 50:512, July, 1951

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REFERENCES:
Spielman, A. D. (1950), N.Y. St. J. Med., 50:2297, Oct. 1.
Brown, E. A., et al. (1950), Ann. Allergy, 8:32, Jan.-Feb.
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Ehrlich, N. J., and Kaplan, M. A. (1950)
Ann. Allergy, 8:682, Sept.-Oct.

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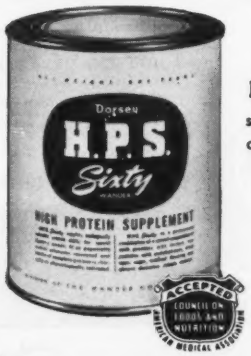

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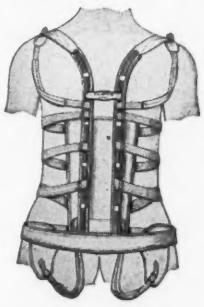

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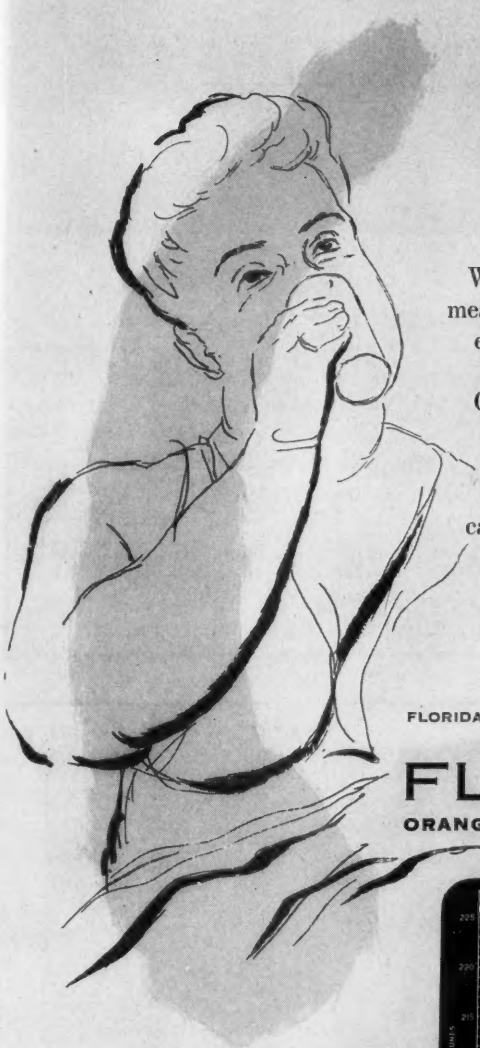

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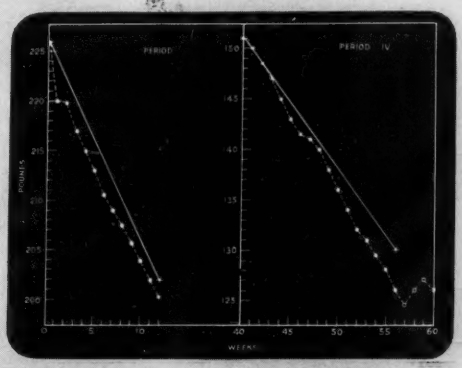

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Volume LIII MAY, 1952 No. 5

Gangrenous Intussusception

Herbert H. Hesser, M.D.,* Chester L. Young, M.D.,* and Frederic Speer, M.D.**

Kansas City, Kansas

There are few cases of recovery following intestinal resection for irreducible intussusception under the age of one year. The case reported was characterized by the unusual finding of a double intussusception with rapid progress to gangrene. Primary resection was successful.

P. P., a five and one-half month old female, was admitted to Providence Hospital, June 7, 1951. Presenting complaints were bloody stools and crying. She had been seen three days before admission because of vomiting and irritability. Temperature was 98.6 F. rectally. An upper respiratory infection with catarrhal otitis media was found. Penicillin was administered and repeated the following day. The day before admission the child presented no evidence of pain and seemed well. At 10:00 A.M. the day of admission, the child began to cry hard and vomited repeatedly. An enema was given and a bloody result was obtained. She was admitted to the hospital at 1:00 P.M.

Physical examination on admission to the hospital showed the temperature to be 99.6 F. rectally. The patient was well developed and well nourished. She was in no apparent distress except at intervals when she would draw up her legs and scream out in pain. No masses were palpable in the abdomen. Rectal examination yielded bloody, currant-jelly type stool on the examining finger.

A diagnosis of intussusception was made. A barium enema done for confirmation revealed small intestine gas suggestive of high grade obstruction and a filling defect in the cecum, the typical rosette deformity of intussusception. The patient was taken to surgery at 2:00 P.M., one hour after admission, and four hours after apparent onset of pain.

As a preparation for surgery 500 cc. of 2½ per cent glucose in normal saline had been started by hypodermoclysis. Drop ether was the anesthetic administered. The abdomen was opened through a lower right rectus incision by one of us (H. H. H.). The terminal ileum was found to have intussuscepted into the ascending colon as far as the hepatic flexure. This intussusception was easily reduced. At this stage it was found that the ileum had telescoped into itself, producing an ileo-ileal intussusception which could not be reduced. About three inches of lifeless bowel was involved in the intussusception. Resection with primary end-to-end anastomosis was decided on. A section of ileum measuring seven inches was resected. The internal layer of sutures was accomplished with 4-0 chromic catgut. This layer was reinforced externally by interrupted sutures of No. 50 spool cotton sutures. The wound was closed without drainage using 2-0 chromic catgut for all layers except the skin which was closed with No. 50 spool cotton.

Postoperative supportive therapy was given in the form of oxygen and intravenous fluids including blood, glucose, and saline. Penicillin was given intramuscularly in daily doses of 150,000 units. Continuous gastric suction was maintained for the first three postoperative days. On the second postoperative day the patient began to have loose, brown stools with the passage of considerable flatus. The abdomen was soft and the general postoperative progress seemed to be satisfactory. The patient was tolerating a soft diet.

Early on the seventh postoperative day the patient vomited, breathing became rapid and labored, and marked abdominal distention developed. At this time the patient was seen by two of us (C. L. Y. and F. S.). Continuous gastric suction and penicillin were resumed. The following day fecal drainage occurred from the operative wound, and the patient had a large bowel movement. From this time on

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improvement was steady. The fecal fistula progressively closed, and the patient was dismissed from the hospital on July 5, 1951. She was examined at intervals for a period of six months and showed complete recovery.

Comment

Instances of recovery following resection for irreducible intussusception are relatively rare. Dowd[1] in 1913 reported a successful resection in a five-day-old infant. Clubbe[2] found but 19 survivals under the age of one year by 1921. Southam and Crawshaw[3] in 1921 reported two recoveries following resection. Perrin and Lindsay[4] in 1921 reviewed 400 cases treated at the London hospital and did not find a single example of survival after resection when the child was below the age of three years. According to Ladd and Gross[5] the mortality rate in babies under one year of age is 75 per cent or more. Of a large series of cases treated for insussusception, they report 43 resections with 10 recoveries, three of which were combined with anastomoses and seven of which had a double enterostomy (Mikulicz's procedure). Wangensteen[6] in 1942 reported a recovery following a stage resection in a four-months-old infant. He recorded two other cases of recovery. From Britain comes the report of Hindmarsh, Stewart, and Morrison[7] of two cases of stage resection and survival of infants, one eight months and the other five months of age. Fallis and Warren[8] report two cases of successful primary resection for irreducible intussusception in infants, one eight months and the other five months of age. More recently Tedesco[9] reports a case of recovery following resection for gangrenous intussusception.

A further study of intussusception brings up the following points for consideration:

A. The value of barium enema in the diagnosis and treatment of intussusception.

Barium enema may serve as an aid but is not essential for the diagnosis of intussusception. A negative barium enema does not necessarily rule out the condition and a positive x-ray may be in evidence in certain cases which are not intussusception.

The four cardinal symptoms of colic, vomiting, bloody mucous stools, and a palpable abdominal tumor almost confirm the diagnosis. Kirsner and Miller[10] in evaluating the criteria of intestinal invagination report that the most frequent signs of invagination are obstruction to the barium with a filling defect, mobility of the obstruction under manipulation, palpable mass, and the passage of barium between the intussusceptum and the intussuscepiens. Kirsner and Miller[10] mention the barium meal to aid in the diagnosis of the enteric variety which is not shown by the barium enema.

Barium enema may be dangerous for it may effect an apparent reduction and lead to unnecessary delay in the operative treatment.

B. The type of treatment.

The treatment of intussusception resolves itself into two types, non-operative and operative. Non-operative treatment does have its advocates. Hipsley[11, 12] has reported a consecutive series of 159 cases treated by rectal injection of saline solution with reduction in 60 per cent. Retan[13] advocates a trial of taxis and barium enema under fluoroscopic control when the patient is seen in the first 12 hours. Wangensteen[6] has tried that method and apparently does not advocate it as he advises opening the abdomen in every case to confirm complete reduction. In this case, found irreducible only four hours after the first known pain, any type of non-operative treatment might very well have been disastrous.

The operative treatment of intussusception is simple when reduction is easily accomplished at the operating table. A grave problem is presented to the surgeon when he is faced with an intussusception which cannot be reduced. The following procedures may be considered in the handling of this difficult situation.

1. Exteriorization of the bowel above the obstruction, leaving the intussusception in the abdomen.[11, 14]

2. The fecal stream may be shunted around the obstruction by lateral anastomosis, leaving the intussusception undisturbed.[5, 8, 11, 14, 15]

3. A resection may be made through an incision in the outer layer as in the Coffey or Jessetts operation.[8, 11, 16, 17]

4. A Mikulicz type of resection may be done.[6, 7]

5. A resection with primary anastomosis may be performed.[1, 6, 8, 18]

Leaving the intussusception in the abdomen as in exteriorizing the bowel above the obstruction, or shunting the fecal stream around the obstruction, may be a dangerous surgical procedure. The gangrenous intussusception may be a possible source of peritonitis or severe intestinal hemorrhage. Resection through an incision in the outer layer is a technically difficult procedure and may expose the patient to sepsis. Enterostomy or colostomy is usually not well tolerated in children because of electrolyte imbalance, rapid dehydration, wound infection, and difficulty in caring for the fistula.

Resection with primary anastomosis carries a high mortality rate, but the other alternatives above mentioned carry an equal, if not higher, rate. Ladd and Gross[5] have stated that the successful resections gathered from the literature were treated in the majority of cases by primary anastomosis of the intestine.

The above does not mean that resection with primary anastomosis should be advocated in all cases of irreducible gangrenous intussusception. Each case must be individualized and the best method chosen. A short circuit to relieve obstruction may be good judgment in a poor risk patient. In 1913 Dowd[1] advocated primary closed resection in all fairly good risk patients. This procedure, which is the most positive of all surgical treatments for strangulated intussusception, must be proved by a careful analysis of case reports of successes as well as failures.

Summary

1. A successful case of primary resection for irreducible gangrenous intussusception under the age of one year is reported. Rapid progress to gangrene and irreducibility was apparently due to the presence of a double intussusception.

2. The literature is reviewed and few of such recoveries are revealed.

3. The various methods of treatment, operative and non-operative, are evaluated.

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The Low Salt Syndrome in Congestive Heart Failure*

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The therapy of refractory congestive heart failure has been greatly improved in recent years by the recognition of the importance of salt restriction and the availability of the mercurial diuretics. We are all familiar now with the concept that retained salt holds its aliquot of additional extracellular water, with resultant increase of vascular and interstitial fluid volume of normal isotonicity. Water given alone is actually an effective diuretic, as ably demonstrated by Shemm[1] and others, resulting in renal excretion along with some salt in the form of a dilute urine, as a result of transiently increased blood volume, greater renal blood flow and increased glomerular filtration. Salt restriction results in decreased blood and interstitial fluid volume, though the normal kidney quickly responds to salt restriction by extremely effective sodium and chloride conservation. The passively congested kidney also conserves salt with great effectiveness, as has been recently demonstrated.[2] The effective use of salt restriction in congestive heart failure is therefore secondary in importance to the improved cardiac action achieved by digitalis. Its greatest value is in prevention of the increasing edema which occurs with salt feeding in the presence of impaired cardiac output.

In these conditions of salt restriction or salt retention in congestive heart failure, the body fluids remain isotonic, provided chronic nephritis does not coexist. That is, the patient suffers from edema rather than water or salt intoxication. In the presence of tubular damage such as exists in independent nephritis, salt and water may be excreted in such disproportion that these intoxications may occur. The kidney of chronic nephritis causes edema by failing to excrete surplus salt, but as a rule the body fluids remain isotonic because of added water intake by the thirsty patient. In so-called salt-losing nephritis,[3] however, salt may be excreted in excess with resulting dehydration and hypotonicity of body fluids. A salt hunger analagous to water thirst apparently does not occur in such patients.

A similar condition may be brought about in congestive heart failure with intact renal function, if, in the presence of restricted salt intake, salt excretion by the kidney is artificially stimulated by the use of mercurial diuretics. Whereas digitalization results in proportionately increased excretions of salt

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and water, the diuresis produced by mercurials is primarily an effect on salt excretion, with water secondarily accompanying this loss to lesser degree.[4] This point is of the utmost importance, since the low salt syndrome is not seen in congestive failure as a result of digitalis and salt restriction alone, but only in the presence of pre-existent renal damage or with excessive use of mercurial diuretics.

The difference is due to the specific disorganization of renal tubular function which occurs in nephritis, or in the therapeutic interference imposed by mercury upon the normal tubular regulation of electrolyte balance. Digitalis does not interfere with tubular regulation, its diuresis being a consequence entirely of improved cardiac output. Pitts and his co-workers[5] have, in the past year, reported careful pharmacologic studies of the site of action of mercurial diuretics. Their evidence indicates that there occurs blocking of tubular reabsorption of chloride and, to a lesser extent, of sodium. During the height of diuresis, the chloride concentration in urine may actually exceed that of plasma. The effect is probably upon the distal tubule, where concentration and dilution are normally accomplished and salt conserved or excreted according to the needs of the body fluids. The proximal tubule, which normally absorbs two-thirds of the sodium in the glomerular filtrate, does so isotonically, and does not vary its absorption of salt except in response to variations in the total amount of glomerular filtrate. It is in the proximal tubule that greatly increased reabsorption of salt may occur in the presence of diminished glomerular flitration due to reduced vascular irrigation of the kidney, such as occurs with the reduced cardiac output of congestive heart failure. The overabsorption of salt in the proximal tubule is presumably a consequence of the prolonged contact of the filtrate with the tubular epithelium. Pitts and Duggan[6] demonstrated that a 25 per cent reduction in glomerular filtration rate may reduce excretion of salt and water by more than 90 per cent when high salt and water loads are imposed in the dog. Merrill[7] maintains that edema accumulates in patients with reduced cardiac reserve when filtration rate falls below 70 cc. per minute, or 60 per cent of normal.

The low salt syndrome, characterized by hypotonicity of body fluids, has been reported increasingly in recent years.[8] It may occur in the presence of persistent edema, though it is more commonly seen with dehydration. Its increasing incidence is due in part to its increasing recognition, but it is also being seen more frequently as a consequence of our increasingly improved therapeutics. Our salt restricted diets have become more severe. Originally recommended diets limiting salt to two grams per day are now limited sometimes to as little as 150 mgms. These low intakes are further reduced by the increasing use of cation exchanging resins which withhold sodium from absorption in the gastrointestinal tract. When, in addition, we resort to the repeated use of mercurial diuretics, we set the stage for the appearance of the low salt syndrome. Mercurial diuretics, formerly used at spaced intervals, and only in the presence of manifest edema failing to respond to digitalis, are now often used with daily regularity, as advocated by Gold,[9] are commonly used for the relief of latent edema to achieve a hypothetical "dry weight," and by some authors are used even before, or in place of, digitalis. In the light of the cardiorenal vascular dynamics of congestive heart failure previously discussed, this last practice appears particularly absurd, although the first two may represent good practice. The improved use of salt restriction and mercurial diuresis in the treatment of congestive heart failure has certainly resulted in better management of patients, lessened disability and probably greater longevity. I would not wish my remarks to be taken as disparaging these valuable measures. But as they are used more effectively, their potentialities for toxicity must be recognized.

The low salt syndrome should be suspected whenever a patient whose salt intake is restricted fails to respond with diuresis to the administration of a mercurial diuretic after having shown previously adequate responses. The low salt syndrome is not the only cause of such lack of response, which may be due to primary renal damage, to marked impairment of cardiac output, or to other electrolyte disturbances (Figure 1). Hypochloremic alkalosis[10]

	Low Salt Syndrome	Hypochloremic Alkalosis	Chloride Acidosis
Serum Sodium	low	normal	normal
Serum Chloride	low	low	high
Serum CO_2	low	high	low
Serum N.P.N	high	normal or high	high
Precipitating Factors	Salt restriction and Mg. diuresis	Mg. diuresis	Continuous ammon. chloride and/or Cation exchange resin
Treatment	NS Saline	Ammon. chloride	Sodium Lactate

Figure 1. Electrolyte disturbances seen in congestive heart failure as a result of current methods of treatment.

is more common under these circumstances than is the low salt syndrome, because the effect of mercurials is greater on chloride excretion than on sodium excretion. This condition is recognized by the low serum chloride and reciprocally high serum carbon dioxide values. It is corrected by the administration of chlorides, usually as ammonium chloride. On the other hand, if ammonium chloride has been administered continuously to congestive heart failure patients receiving mercurials, acidosis and azotemia may appear, as recently reported by

the St. Louis City Hospital group.[11] This condition is characterized by high serum chloride and low serum carbon dioxide, in contrast to the findings in hypochloremic alkalosis, and it is treated with sodium lactate or bicarbonate. It does not occur following intermittent administration of ammonium chloride. Cation exchange resins predispose to this condition of acidosis, because they substitute hydrogen or ammonium for sodium ions in the gastrointestinal tract. Potassium balance does not appear to be significantly disturbed in any of these conditions, according to studies currently reported.[12]

The low salt syndrome is characterized by low serum values for sodium, chloride and carbon dioxide, indicating hypotonicity of body fluids. Though rarer than hypochloremic alkalosis, it is more dangerous, and unless recognized and corrected early, usually results in a fatal outcome. Its clinical manifestations are those of water intoxication, though the patient may actually have a hypotonic dehydration resembling adrenocortical insufficiency. The concentration of serum proteins and hemoglobin are increased. The volume of urine is decreased, the rate of glomerular filtration falls and the nonprotein nitrogen of the blood rises. The cardiac output is strikingly decreased. This picture was produced in dogs by Darrow and Yannet[13] by electrolyte loss without change in body water. The animals looked sick, refused food and were weak. These authors demonstrated an increase in intracellular water, reducing the intracellular electrolyte concentration about two-thirds as much as the reduction in extracellular concentration. It is presumably this intracellular disturbance which results in death. The picture of medical shock occurs. Similar findings are reported by Elkinton and Winkler,[14] who produced the syndrome by intraperitoneal water injection followed by withdrawal four hours later. Saline infusions rapidly and completely restored the animals.[15] McCance[16] in London produced the low salt syndrome in himself and other volunteers by salt restriction, excessive sweating, and unlimited water intake, with similar symptoms and electrolyte disturbances, attributed by him primarily to diminished glomerular filtration. The symptoms as seen in patients are described by Schroeder,[17] and include drowsiness, weakness and lethargy, loss of appetite sometimes with thirst, nausea and occasional vomiting, occasionally abdominal or muscular cramps, and increasing edema if previously present. Massie[18] mentions in addition the occurrence of dizziness, confusion or frank psychosis, followed at times by convulsions and coma. The diagnosis may be suspected in the presence of such symptoms in the salt restricted patient who has been receiving mercurial diuretics and no longer responds with diuresis or who has developed oliguria with rising blood urea, but it should be confirmed by blood electrolyte studies. The mechanism by which hypotonicity of body fluids produces partial renal shutdown is not understood, but it is apparently not dependent on circulatory insufficiency, since arterial and venous pressures may be unchanged, although blood viscosity may increase. It may be due to the intracellular hydration described by Darrow and Yannet,[13] affecting the kidney cells as well as all other tissues.

Treatment of the low salt syndrome consists of early and adequate replacement of salt, as a hypertonic solution, since isotonic solutions serve merely to increase edema without relieving hypotonicity. A five per cent solution is usually used. The quantitative salt requirement may be calculated from the serum electrolyte figures, though restoration often occurs with less than the calculated quantities. The production of pulmonary edema, theoretically a hazard in the administration of fluids in congestive heart failure, does not seem to have occurred in the cases reported nor in our limited experience. Water intake must be limited if the patient manifests thirst, which is not usually the case. Restoration of normal serum electrolyte values results in return of normal renal function and of diuretic response to mercurials, provided irreversibility has not yet occurred.

CALCULATION OF SODIUM DEFICIT FROM BLOOD CHLORIDE AND CO_2 VALUES

(1) $\text{mEq. Na} = \underset{142}{\text{Cl}} + \underset{25}{\text{HCO}_3} + \underset{14}{\text{Other anions}}$

(2) $\frac{\text{serum Cl mg.\%}}{355} = \frac{\text{serum Cl as NaCl mg.\%}}{585} = \text{mEq./L. Cl}$

(3) $0.42 \times [\text{CO}_2 \text{ vol.\%}] = \text{mEq./L. HCO}_3$

(4) $\text{Deficit mEq./L. Na} = \text{Deficit mEq./L. Cl} + \text{Deficit mEq./L. HCO}_3$

(5) $[0.7 \text{ Kg. Wt.}] \times [\text{deficit mEq./L. Na}] = \text{Total deficit in mEq.}$

(6) $0.058 \times [\text{Total deficit in mEq.}] = \text{Total deficit in Gm. NaCl}$

Figure 2

In the absence of laboratory determinations of blood sodium, the approximate sodium deficit may be calculated from the serum chloride and bicarbonate values, as indicated in Figure 2. In using this calculation, 70 per cent of the body weight is assumed to represent its water content, including intracellular water which must also be returned to isotonicity. In uremia of long standing, and in diabetic acidosis, the calculation by this means will overestimate the sodium deficit, because accumulation of organic acids or ketones in the serum replaces

chloride and bicarbonate from their combination with sodium, and that portion of the sodium combined with the organic acids or ketones will not be included in the calculation.[19]

In any case, it is safest to administer on any one day only half the calculated deficit, since many patients will restore normal values with less than the calculated amounts of salt. If the patient is unable to take salt by mouth, and the peripheral veins are collapsed, it is feasible to administer hypertonic saline by intrasternal infusion. This was done in the final days of life of the patient reported in this paper. Sternal blood clots so quickly as often to occlude the needle before the flow can be established; in this event, forcible administration through the needle of an initial syringeful of fluid will clear the needle and allow uninterrupted continuation of a rapid flow.

The following case history is an example of the low salt syndrome and its management in the presence of severe refractory congestive heart failure, with initial response to salt replacement but eventual fatal issue:

This obese negro male was discovered to have asymptomatic hypertension in 1946, at the age of 26. Weakness and ankle edema appeared in October, 1948, at which time his blood pressure was found to be 236/150. He refused hospitalization but accepted a 1200 calorie diet low in protein and salt, and was given ammonium chloride and digoxin at the University of Kansas Medical Center. This regime relieved his symptoms and dropped his blood pressure to 190/130. In March, 1949, frontal and occipital headaches appeared. The Kempner rice diet was then prescribed and maintained faithfully for six months, the patient losing 40 pounds in weight and experiencing considerable relief. Left precordial pain, unrelated to exertion and relieved by belching, appeared in October. The patient's apprehension about his heart motivated his admission to Winter Hospital in January, 1950.

On examination, he was markedly obese and of hypersthenic physique. Blood pressure was 230/150 in both arms. Ophthalmoscopic examination revealed only moderate arteriolar spasm. The apical cardiac impulse was localized to the left of the midclavicular line in the sixth interspace. The liver was palpable two cm. below the costal margin, and there was slight pitting ankle edema. Laboratory studies were within normal limits, and the urine concentration was 1.024, with no albuminuria or casts. Fluoroscopically, the heart was seen to be in transverse position, with moderate elongation of the left ventricular outflow and inflow tracts and slight but definite left auricular enlargement. An electrocardiogram showed left ventricular hypertrophy with delayed intraventricular conduction and electrical pulsus alternans. Amytal sedation produced little change in diastolic pressure. Psychiatric study revealed considerable chronic suppressed anger concerning his race, his work and his wife, with a marked compulsive trait.

In view of the severe hypertension with early congestive failure, in a young patient with good eyegrounds and renal function, the various radical therapies were considered. The patient did not desire sympathectomy for fear of loss of employability, and promised to adhere to a low calorie rice diet for six additional months, at which time the desirability of sympathectomy was to be reevaluated. He was discharged taking digoxin, phenobarbital and aminophyllin.

The patient was again admitted June 7, 1951, one and one-half years later, with complaints of severe dyspnea and ankle edema for two and one-half months and nocturnal paroxysmal dyspnea for the past one and one-half months. He had maintained the rice diet, and had been taking 0.1 mg. digitoxin daily. He had lost about 35 pounds in the past year, but still weighed 190 at a height of five feet seven and one-half inches.

On examination, he was dyspneic at rest, with congested neck veins. Ophthalmoscopic examination revealed arteriolar narrowing with marked venous compression, and one small area of exudation. Crepitation was present at both lung bases. The blood pressure was 240/160 in both arms, with

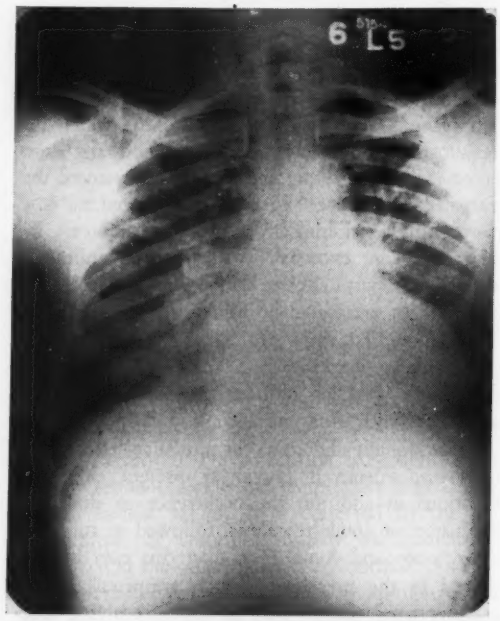

Figure 3. Chest x-ray of patient J. G. at time of final hospital admission.

pulsus alternans in the upper 10 mm., and the systolic pressure was 260 in both legs. The heart was large, and the pulse regular at a rate of 94. The aortic second sound was accentuated. The liver was palpable five cm. below the costal margin, and was firm, smooth and tender. Edema of the legs was moderately severe.

The urine showed three plus albumin persistently. Blood urea nitrogen was 18 and 16 mg. per cent on two determinations. Chest x-rays revealed greater enlargement of the heart than previously, and congested lung fields (Figure 3). The arm to tongue circulation time was 50 seconds.

Except for transient initial improvement, the patient's congestive heart failure proved refractory to therapy, which consisted of maximal dosage of digitoxin, ammonium chloride, mercurial diuretics, low salt intake limited to 1.0 gram of sodium daily, and cation exchange resin. Thrombosed leg veins could not be identified in the increasingly edematous legs, but edema of the left arm developed three weeks before death and was attributed to axillary vein thrombosis. During the terminal week the patient exhibited numerous attacks of chest pain, cough and bloody sputum, attributed to recurrent pulmonary emboli. Peripheral circulatory failure, gallop rhythm, and Cheyne-Stokes respiration existed during the final four days. The blood urea nitrogen rose progressively as circulatory failure developed. The blood pressure never varied, even during the terminal peripheral circulatory collapse. During the final two and one-half weeks, the patient was moderately febrile. Penicillin was administered continuously during the final four weeks, as prophylaxis against bronchopneumonia. Four plus albuminuria and hyaline and granular casts were present consistently during the last five weeks. Death occurred July 21, on the 62nd hospital day. Food and fluid were ingested fairly well until the end.

Postmortem examination was performed by Dr. Alfred Plaut. Autopsy diagnoses were: (1) Cor bovinum; calcification in myocardium; massive thrombosis in right atrium and left ventricle; small thrombosis in left atrium; (2) Large hemorrhagic infarcts in lower lobes of both lungs; small infarcts in other portions of lungs; (3) Infarct in left kidney; (4) Thrombosis of left subclavian vein with severe edema of left arm; edema of legs; (5) Hemorrhage in trachea and colon; (6) Stasis in liver and spleen; fatty change in liver; (7) Duodenal ulcer; blood in stomach and intestine; (8) Edema of brain; (9) Miliaria.

Figure 4 charts the low salt syndrome and its management in this case. After a month of salt restriction, cation exchange resin, repeated mercurial diuretics, and digitoxin in the amount of 0.4

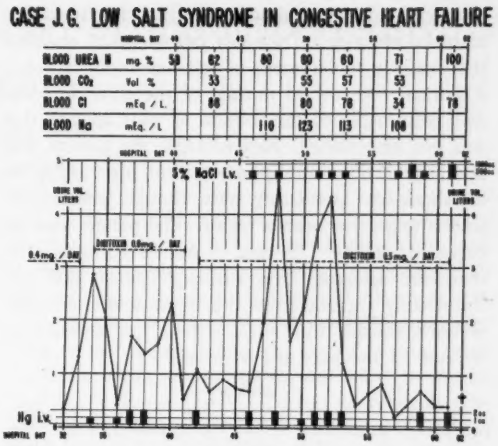

Figure 4

mgm. daily, the patient had become increasingly edematous and dyspneic, with diminishing urine output. The dosage of digitoxin was increased to 0.6 mgm. daily for a period of eight days, with moderate increase in diuresis. Digitalis toxicity did not develop on this dosage, probably because the edematous gastro-intestinal tract failed to absorb all of the administered oral dose. Nevertheless, because of fear of toxicity, and because the response did not appear impressive, the digitoxin dosage was then reduced to 0.3 mgm. daily. At about this time, on the 40th hospital day, the blood urea was found to have risen from its initially normal figures of 18 and 16 mgm. per cent to 58 mgm. per cent. Electrolyte imbalance was suspected, and verified by subsequent determinations revealing low serum chloride, bicarbonate and sodium. On the 47th hospital day, blood sodium reached a low of 110 mEq./L. and the urea nitrogen had risen to 80 mgm. per cent. Salt replacement therapy resulted in excellent diuretic response, as shown, with concomitant rise in blood sodium, chloride and bicarbonate to more nearly normal figures, though still low, and a drop in blood urea nitrogen to 60 mgm. per cent. Oral potassium intake was prescribed at this time, as an additional precaution against potassium deficit. Mercurial diuresis was continued, which was, perhaps, inadvisable, since subsequent figures show that hypochloremia was induced by the mercurial chloruresis. From this experience, better therapy would seem to be correction of the electrolyte imbalance before resorting again to mercurial diuresis. The desperate state of the patient had prompted us to attempt the combined therapy. After six days of diuretic response to salt replacement, the patient failed to show further response, developed further fall in blood sodium, chloride and bicarbonate, with rise in urea nitrogen to 100 mgm. per cent and died

after eight days of oliguria. A final determination of blood chloride on the day before death revealed that massive replacement of salt had brought about a marked rise toward normal of the chloride level, and presumably of the sodium as well, though this was not determined. Nevertheless, the patient was now irreversibly unresponsive, due presumably to his shock-like circulatory state, though intracellular edema may have been a factor. The patient had received a total of 275 Gm. of salt in 16 days, a remarkable amount. His massive edema was not discernably increased by this treatment, but daily weights during this period were not determined because of the patient's weakness.

Summary

The low salt syndrome is discussed and differentiated from other electrolyte imbalances which occur in congestive heart failure as a result of current methods of treatment. A case example of the low salt syndrome in congestive heart failure illustrates the diagnosis and management.

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Ophthalmoscopic Evaluation of the Hypertensive Patient*

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The purpose of this paper is to discuss the optic fundus changes in vascular hypertension and to compare two of the best methods of evaluating these changes.

One method, (Wagener, Clay, Gipner),[1] is more detailed and exact, but more time-consuming; whereas, the other method, (Keith, Wagener, Barker),[2] is less exacting but more economical of time and is, therefore, sometimes more practical as a routine procedure.

The ophthalmoscopist must choose the method which is best suited to his requirements. If necessary, the two methods can be combined.

Introduction

As a result of hypertensive disease, pathologic failure may strike certain areas, particularly the eyes, brain, heart, and kidneys. One common denominator of the changes in these organs is diffuse arteriolar disease; in the eye, there is an unusual opportunity to observe the circulation at the arteriolar and precapillary levels, in the living patient, under a magnification of approximately 16 diameters. It must be remembered, however, that the eye is a relatively small area and that analogous changes elsewhere in the body are only implied and must depend for their final evaluation upon the correlation of complete clinical and laboratory data.

Although the examination of the optic fundi should not be over-emphasized in the total evaluation of the hypertensive patient, it should be pointed out that the ophthalmoscopic findings may have prognostic importance, at times serving as a sensitive (and occasionally the first) indicator of an acceleration in the course of the hypertensive disease.

In this regard, it seems paradoxical that the degree of severity of the changes in the fundus is not necessarily an indication of the height of the blood pressure, and this seems especially peculiar since elevation of the blood pressure is the only known common factor responsible for fundus changes in hypertensive states of various kinds. The evaluation of other influences, such as neurogenic and humoral factors, remains a matter for future determination.

The prognostic significance of the observed changes in the eye is subject to some variation, and it therefore holds more accurately for groups than for individual patients. Keith[2] and his associates, however, in an extensive and carefully controlled study with follow-ups lasting as long as nine years, showed a positive correlation between the ocular findings and the survival curves of patients who were divided into four groups according to various criteria of severity of hypertensive disease, the appearance of the eye grounds having a prominent place in this classification (see below).

Regardless of the means used to classify and grade the changes which occur in the eye as a result of hypertensive disease, it should be recognized that these methods are elaborations of the fundamental, eye-ground changes which may be classified under three general headings:

1. *Angiopathy*—changes in the vessels. Vascular alterations consist of local or generalized arteriolosclerosis and phlebosclerosis, and focal or spastic arteriolar constriction, and generalized attenuation or narrowing of the arterioles. It is presumed that arteriolar spasm and attenuation, beginning as a functional disturbance, may become fixed by the superimposition of a sclerotic process, probably requiring about four to six weeks for permanent changes to occur.

2. *Retinopathy*—changes in the retina. The retinal changes consist of extravasations and infarctions.

The extravasations consist of edema and hemorrhages, usually occurring superficially in the nerve-fiber layer. The terms "exudate" and "retinitis," sometimes used to describe these extravasations, are inapplicable, since there is no actual inflammatory response. Edema may be localized or diffuse. Localized edema (cotton-wool patches) may resolve incompletely, leaving sharply-defined, hyaline deposits (edema residues). When these, or fresher edema, occur near the macula, they tend to be radially disposed around the macula like the nerve fibers in this area (macular star). In some instances diffuse edema is distributed over large areas of the retina; when this is intense, it may result in serous detachment of the retina.

As a result of the individual or combined effects of vascular sclerosis, arteriolar attenuation and con-

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striction, intimal and elastic proliferation with obliterative endarteritis and endophlebitis, either hemorrhagic or ischemic infarction may occur in the retina.

Friedenwald,[3] applying the Hotchkiss staining technique to flat preparations of the retina, was able to demonstrate that many areas of cotton-wool patches found in hypertensive patients (but not exclusively, since these pathologic areas are observed also in other retinopathies), are cytoid-body lesions found near the terminal arterioles in such a position that they are presumably ischemic infarcts resulting from the occlusion of the arterial flow just distal to the bifurcation of the terminal arteriole. Since serial sections in many instances failed to reveal any arteriolar plug, it is inferred that some of these occlusions are constrictive.

These lesions will usually disappear in three or four weeks, healing by an ingrowth of new capillaries. Occasionally, due to advanced degrees of narrowing and/or sclerosis in the larger arterioles some of the main branches, or even the central retinal artery itself, may be occluded. Central vein thrombosis may occur, also, but tributary thrombosis is more common and less devastating, although venous thrombosis, wherever it occurs, produces multiple bleeding points into the nerve-fiber layer of the retina, and the fundus picture of an episode of this sort must be differentiated from a severe hypertensive retinopathy, since the venous thrombosis, while serious to the eye, may occur without the grave prognostic significance which accompanies a hypertensive retinopathy of similar, bold coloring.

3. *Neuropathy*—papilledema, edema of the optic disc. This is usually associated with retinopathy, and is then referred to as *neuroretinopathy*. The pathogenesis of this papilledema is not well understood but is always of grave significance, indicating a terminal stage of the disease. It is probably most often evidence of increased intracranial pressure accompanying hypertensive encephalopathy, or, in some cases, may represent an extension of a severe retinopathy. Edema of the disc occasionally occurs without retinopathy; such cases are rapidly progressive.

Methods of Grading and Classification of Retinal Hypertensive Changes

The choice of a method of grading hypertensive fundus lesions depends upon the observer's needs, and since these needs may vary, it is not possible to designate one method as the best. The choice is relatively easy in most instances, however, since the field can be narrowed to the two most useful, the Wagener-Clay-Gipner method and the Keith-Wagener-Barker grouping, each of which is best in its own field of application.

Because of the lack of correlated information, there is no method with weighted evaluations of the lesions to provide a numerical grading system; but, for the purposes of the cardiologist, the internist with a special interest, the ophthalmologist, or for the clinical investigator in this field, the classification and method of grading proposed by the American Ophthalmological Society,[1] through its committee (Wagener, Clay and Gipner) on the study of this problem, is excellent for recording detailed descriptions of the hypertensive, optic fundi. The essential features of this classification are as follows:

Wagener-Clay-Gipner (AOS Committee) Classification[1]

This classification of the retinal vascular lesions of hypertension recognizes the three fundamental types of alterations which may occur in the retinal arterioles in hypertensive disease, namely, *generalized narrowing* (which probably represents the generally increased tone of the arteriolar system), *focal constriction* ("spasm"), and *sclerosis* (organic thickening of the wall of the arteriole).

Generalized Narrowing of the Arterioles.

Grade 1. Reduction of caliber of the arterioles to ¾ average caliber or an A-V ratio of ½.

Grade 2. Reduction of caliber of arterioles to ½ average caliber or an A-V ratio of ⅓.

Grade 3. Reduction of caliber of arterioles to ⅓ average caliber or A-V ratio of ¼.

Grade 4. Arterioles thread-like or invisible.

Focal Constriction or Focal Sclerosis of Arterioles.

Grade 1. Localized narrowing to ⅔ caliber of proximal segment of arteriole.

Grade 2. Localized narrowing to ½ caliber of proximal segment of arteriole.

Grade 3. Localized narrowing to ⅓ caliber of proximal segment of arteriole.

Grade 4. Arteriole invisible beyond the point of constriction, (or, in the case of focal sclerosis, visible only as a thin fibrous cord).

Generalized Sclerosis of Arterioles (Figure 1).

Grade 1. Brightening or increased lustre of the arterioles; mild depression of the veins at the points of arteriolar crossing with reduction of visibility of those portions of the veins which underly the crossing arteriole.

Grade 2. Burnished coppery color of the arterioles, with definite depression of underlying veins, widening of the apparent arteriolovenous crossing spaces and almost complete invisibility of

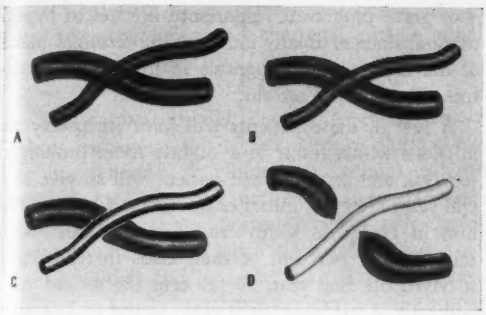

Figure 1. Progressive stages of sclerosis in a retinal arteriole, illustrating the associated changes in the underlying vein at the arteriolovenous crossing, changes sometimes inadequately referred to as "nicking." The grading is according to the method of Wagener, Clay, and Gipner[1] (*q.v.*): *A*, normal arteriolovenous crossing; *B*, sclerosis, grade 1; *C*, sclerosis, grade 2; *D*, sclerosis, grade 3. (Grade 4, in which the arteriole appears as a fibrous cord, is not shown.)

those portions of the veins which underly the crossing arterioles.

Grade 3. Polished silver color of the arterioles. Widening of the apparent arteriolovenous crossing spaces with a change in the course of vein ("right-angled crossing" or "deflection"), complete invisibility of those portions of the veins which underly the crossing arteriole, distal dilatation of the veins ("banking"), and apparent tapering of the veins as they underly the crossing arteriole.

Grade 4. Arterioles visible only as fibrous cords without blood streams.

The A.O.S. committee has further proposed to classify the diagnostic lesions in the retina according to terminology which reflects the clinical course of the hypertensive pattern in the eye grounds. While such a classification does not include a numerical grading of severity, this deficiency does not detract from its prognostic significance.

The following is the A.O.S.-recommended classification of vascular hypertension (on the basis of the angiopathy and retinopathy produced):

Neurogenic Hypertension

No diagnostic lesions in the retina, even in cases of considerable duration, except perhaps mild generalized narrowing of arterioles.

Acute Hypertension ("Angiospastic")

No arteriolosclerosis.

Generalized narrowing of the arterioles.

Focal constrictions in arterioles.

Edema of retina, cotton-wool patches, hemorrhages (usually).

Edema of the disc (often).

May terminate in recovery, chronic hypertension, or in rapidly progressive (fulminating) malignant hypertension.

Chronic Non-progressive ("benign") Hypertension

Only mild, generalized narrowing of arterioles (grade 1 or 2), if seen in early years.

Also mild, generalized arteriolosclerosis (grade 1 or 2) is seen after several years duration of the hypertension.

At times ischemic or hemorrhagic infarctions of the retina.

Chronic Progressive Hypertension

Always generalized arteriolosclerosis.

Generalized narrowing of arterioles.

Focal constrictions in arterioles.

At times focal arteriolosclerosis.

At times cotton-wool patches and hemorrhages in retina.

Terminal, Malignant Hypertension

Always generalized arteriolosclerosis.

Always papilledema.

Generalized narrowing of arterioles.

Focal constriction in arterioles.

At times focal arteriolosclerosis.

Usually edema of retina, cotton-wool patches, and hemorrhages. Often residues of edema in form of macular stars or scattered punctate deposits.

Note: Any of these varieties or phases of hypertension, except neurogenic variety, may be primary ("essential") or may be secondary to some demonstrable causative lesion or disease.

Keith-Wagener-Barker Classification[2]

This clinical grouping of essential hypertension cases is sometimes erroneously considered a classification on the basis of the eye grounds alone. It is true that the retinal observations occupy a prominent place, but the classification is, nevertheless, clinical in the broad sense and takes into account the evaluation of the whole patient.

This method is useful for practitioners and clinicians who are interested in a fairly rapid and "practical" evaluation of the eye grounds without resorting to detailed descriptions and examinations. It is, however, less exacting as an investigative tool.

The division into clinical groups is as follows:

Diffuse Arteriolar Disease with Hypertension (Essential).

Group 1. The hypertension does not usually reach high levels and can be long-standing without causing symptoms. Cardiac and renal functions are adequate, and there is, at most, a slight albuminuria at times and a gradual development of cardiac hypertrophy; EKG changes are minimal. There is no retinopathy, and the changes in the retinal vessels are slight or absent. Five-year survival in this group of patients in the original study was found to be approximately 70 per cent.

Group 2. These patients usually have moderate to marked sclerosis of the retinal arterioles, and occasionally hemorrhagic or ischemic infarctions may occur. It is to be noted that these patients may have a severe angiopathy but will not have retinopathy.

Occasionally patients at first appearing to belong to this group may actually belong to group 3 or 4, because of their markedly progressive nature. It is sometimes necessary to observe cases over a period of time to determine this.

Patients in this group enjoy good general health, sometimes for many years, and cardiac and renal functions are affected but adequate. Whereas, the disease in group 1 is almost non-progressive, it is slowly progressive in group 2. In the original series, approximately 50 per cent of the patients in this group survived for more than five years; however, certain patients belonging to this group lived comfortably for many years.

Group 3. Hypertension in the patients in this group is often high and frequently without remission. Diffuse arteriosclerotic changes can be palpated in some of the larger arteries, such as the radial, posterior tibial, and superficial temporal. Cardiac and renal functions may be adequate to sustain the individual, but usually show signs of beginning impairment. Headache, dizziness, and visual disturbances are common.

The optic fundus reveals retinopathy as well as angiopathy; there may be diffuse edema, cotton-wool patches, and hemorrhages in the retina, superimposed upon a combination of arteriolar changes, consisting of sclerosis, attenuation, and spasm. The edema in the eye-grounds of these patients is limited to the extrapapillary regions and does not involve the disc. The percentage of survivors beyond five years in this group was about five per cent. Occasionally patients in this group will have remissions, during which there will be symptomatic relief as well as partial improvement of the angiospasm and retinopathy.

Group 4. The patients in this group have a persistently high blood pressure, palpable arteries in their peripheral circulation, and marked retinal changes. Cardiac and/or renal functions are soon seriously impaired. Symptoms of encephalopathy are frequently present. There is often nervousness, asthenia, loss of weight, headache, disturbances in vision, exertional dyspnea, nocturia, and symptoms of neurologic lesions. The findings in the eye grounds consist of severe angiopathy (including all degrees of sclerosis, attenuation, and spasm), and neuroretinopathy.

This last feature, more especially the papilledema, is of grave prognostic importance in cases of hypertension, since it usually indicates the terminal phase of the disease. The prognosis in this group, therefore, is extremely serious.

A few of these patients will have temporary remissions which result in a slightly more prolonged survival, and an occasional patient will survive several years after the initial examination which placed him in group 4. Keith[2] and his associates found that only 20 per cent of their cases in this group survived the first year, 10 per cent the second year, and only 2 per cent were alive at the end of five years.

It is often useful, and always adds to the accuracy of the fundus examination when this method is used, to combine this Keith-Wagener-Barker grouping with the Wagener-Clay-Gipner (A.O.S.) graded descriptions of the angiopathy. The observer might report, for example, Group 3, hypertensive fundus with Grade 2 sclerosis and narrowing. Sensitivity of observation is thus increased, so that changes and progression can be observed within each group in addition to the graduation from one group to another.

Comment

Retinopathy and papilledema imply a serious prognosis; it is therefore of considerable importance that the ophthalmoscopist be acquainted with the conditions with which they may be confused. For the practitioner whose work requires the frequent use of the ophthalmoscope, this presents no particular problem, as a rule. To the occasional ophthalmoscopist, however, fundus abnormalities associated with conditions other than hypertension may be confusing or even misleading.

Some of the conditions with which hypertensive retinopathy or neuroretinopathy may be confused are as follows: the retinopathy of diabetes, particularly when associated with hypertension; the fundus pictures of tributary or central venous thrombosis, chorioretinitis, retinitis pigmentosa (especially when the pigmentary disturbances are minimal or confined to the periphery); the fundus lesions associated with severe anemia and leukemia; optic neuritis; the papilledema associated with acute toxemias or with increased intracranial pressure due to brain tumor; and conditions simulating papilledema, such as congenital pseudoneuritis and medullated nerve fibers.

Lesser to moderate amounts of retinal vascular sclerosis often occur as a part of the normal aging process. Otherwise, however, this sclerosis may be taken as an indication of the chronicity of the hypertensive process.

Similar findings in the choroidal vessels are often

associated with these changes, and pigmentary disturbances overlying the choroidal vessels, usually in the periphery of the fundus, are also manifestations of hypertension of long standing.

Ophthalmoscopically these pigmentary disturbances are seen as small black spots or clumps, often with a yellowish or pinkish halo around each one, and situated near the peripheral choroidal vessels (Elschnig patches), or the pigment may be distributed as a series of small black dots arranged close to each other and in a row, like a string of beads (Siegrist streaks), overlying a peripheral choroidal vessel, usually sclerosed.

Attenuation and spasm of the retinal arterioles usually indicate varying degrees of *progressive* hypertensive disease. The development of neuroretinopathy, that is, retinopathy associated with papilledema, often means increased intracranial pressure and indicates a terminal stage of disease. Occasionally, papilledema will appear before there is any evidence of retinopathy; this must be considered evidence of an acutely developing angiospastic type of hypertension.

The study of cases for investigative purposes, or the selection of cases suitable for sympathectomy, should employ the most exacting methods of classification and grading of the eye-ground findings in order that they may be correlated with results. In many instances repeated observations of the fundi are necessary for proper evaluation.

As regards the selection of cases for sympathectomy, the interpretation of the eye findings has not yielded sufficiently consistent results to formulate any reliable and rational method. However, in general, it may be said that patients in Keith, Wagener, and Barker Group 1 probably do not need surgery, those in Group 2 may do as well on medical treatment, occasionally better, while those in Groups 3 and 4 should be considered for surgery. As a rule, signs of progression increase the urgency and desirability for surgery in the treatment of the essential hypertensive patient, while ocular evidence of moderately advanced to advanced sclerosis is a discouraging prognostic sign as regards the results of sympathectomy, although sclerosis does not, *per se,* constitute a contraindication. Such observations must be correlated with other clinical and laboratory data in the selection of these cases.

Spontaneous remission must constantly be kept in mind as a possibility, even in group 4 patients, when evaluating the effects of surgical or other treatment.

Summary

The optic fundus changes of vascular hypertension and methods of evaluating these changes are discussed. The methods described by Wagener, Clay, and Gipner and by Keith, Wagener, and Barker are the two most useful, each having its own advantages. These methods may be used individually or in combination, depending upon the specific requirements of the examination.

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The Control of Postoperative Pain in Ano-Rectal Surgery*

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The need for a reliable, non-toxic anesthetic agent which would produce a local anesthesia for a prolonged period is rather well known. The proctologic surgeon is perhaps more acutely aware of this need since postoperative pain following ano-rectal intervention is marked. It is significant that the laity considers surgery to this area particularly painful and for this reason many delay treatment.

In the past many agents have been proposed for post-operative pain control and have subsequently been found wanting. The use of the anesthetic oil solutions for pain following proctologic surgery was first suggested in 1927.[1]

The rationale for the use of these solutions was dependent upon the immiscible oil solvent inhibiting the absorption of the anesthetic agent. The first studies[2, 3, 4] of the use of these agents were soon followed by contradictory reports[5, 6] describing their failure. This controversy was resolved by the work of Duncan and co-workers[7] who demonstrated that any prolonged anesthetic effect observed was due to a neuro-degeneration caused by benzyl alcohol, a common agent of the preparations exerting a positive effect, and not because of the oil solvent. Kelly[8] confirmed this work and clinically proved the failure of the anesthetic oil solution. It should be noted that in addition to their general anesthetic failure, these oil solutions produced abscesses, encapsulated oil-cysts, local tissue reactions and sloughs.

A new approach to the problem of prolonged local anesthesia is provided in the development of Efocaine.[9] The rationale for this agent is based upon the well known pharmacologic fact that agents which are slightly soluble are slowly absorbed and therefore exert a prolonged effect. This is the basis for the extended effect observed with the suspensions of the hormones[10] and with procaine penicillin.

While a prolonged effect may be observed with certain suspensions, this class of pharmaceutic preparations has many inherent limitations. Accurate dosage is impossible because of sedimentation. The large bore needle necessary to permit the passage of the particles causes undue operational trauma. In particular reference to the anesthetic bases, these hydrolyze on contact with water which obviates their use as suspensions.

These limitations are entirely circumvented by Efocaine, which is a solution of the normally insoluble procaine base and butylamino-benzoate in an aqueous-miscible, non-toxic, organic solvent. This solution is at saturation limits so that the addition of even minimal amounts of body fluid (serum or lymph) causes a complete and immediate precipitation. Thus, when this drug is injected into the body, the dilution by the body fluids causes a deposition of the anesthetic agents to form a crystalline depot, which is slowly absorbed to produce a prolonged effect.

Since Efocaine is a clear solution, with many of the properties of water, a narrow gauge needle may be used. Pathologic study[10] revealed that this agent does not encapsulate, nor does it produce neurodegeneration. In fact, it has been shown[11] that the liquid phase is almost entirely excreted within 24 hours. The residual anesthetic depot has been pharmacologically demonstrated to produce an effect for approximately two weeks[12] without any local or systemic toxicity.

In view of desirability of an agent with these properties in ano-rectal surgery, it was deemed important to explore its scope and application to proctology.

Experimental

The surgical cases studied were unselected and, for the most part, consecutive. The patients ranged in age from 14 to 85 years, consisting of 17 males and 23 females. There was no deviation from the normal operative technique, and the usual surgical anesthesia were employed.

The main sensory nerve supply to the anal and perianal skin traverses the ischiorectal fossa. The large nerve branches, mainly the inferior hemorrhoidal nerves and the perianal branches of the fourth sacral nerves, approach the anus from the posterolateral aspect. They lie deeply in the subcutaneous fat, even at the anal verge, and pass inward through the external sphincter muscles. The anesthetic solution must therefore be deposited in a manner to block all sensory stimuli to these nerves. Efocaine was injected locally into the perianal tissue, at the conclusion of surgery.

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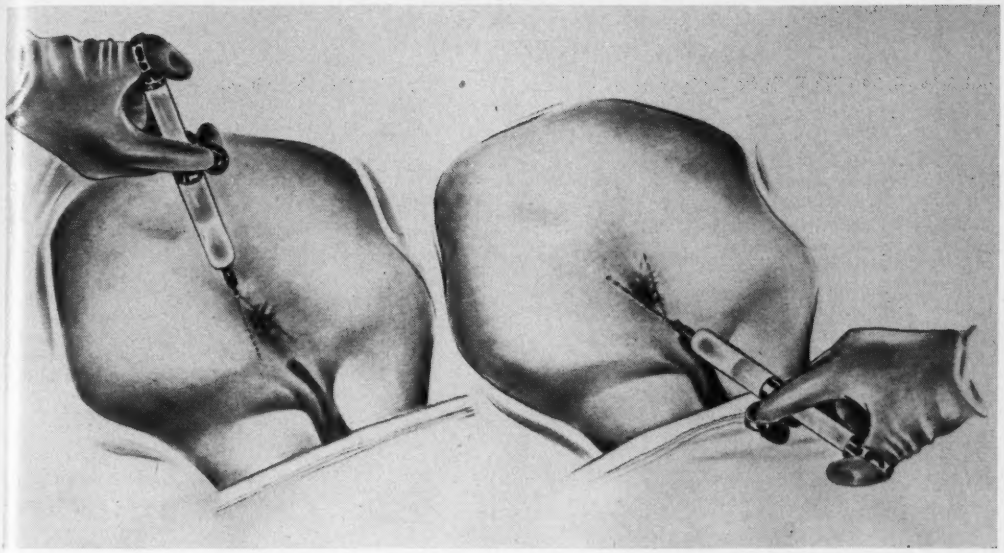

Figure 1

Figure 2

Technique of Injection

A three inch, 22 gauge needle is inserted into the tissues of the posterior commissure about one inch from, and parallel to, the anus (Figures 1 and 2). Slowly inject a small amount of Efocaine ahead of the needle. Withdraw the needle to the skin surface, and without withdrawing from the skin, reinsert the needle into the deeper subcutaneous tissue, laterally, toward the right side, and repeat the injection keeping the solution ahead of needle while injecting. This procedure is also carried out on the left side. Insert the needle in the anterior commissure and inject in the same fan-wise manner as described above.

Approximately 10 cc. of Efocaine will serve to completely anesthetize the area for almost all anorectal surgical indications. The exact amount will depend upon the particular needs of the patient and the extent of surgery. This should be evenly distributed throughout the tissue in order to achieve a complete block of the nerves innervating this area.

At no time should the needle penetrate through the rectal wall nor should the drug be deposited intradermally. Care should be taken that no bulging results from the injection (an indication of too superficial deposition). It is extremely important not to pool the agent, and the anesthetic solution should be introduced slowly and continuously as the needle is withdrawn, and a fan-wise distribution instituted.

This technique of injection presupposes that the patient is under the control of another anesthetic. When this is not applicable (local injection for pruritus ani or dilations), then skin-wheals should be raised with procaine-hydrochloride solution and the needle inserted through the wheal.

In order to limit the subjective influences as much as possible, neither the patient nor the attending and nursing staffs were aware of the nature of this study. The patient was carefully followed for the presence of pain, the development of any local tissue reactions, presence of anesthesia and the effects on wound healing throughout the convalescence.

An objective index of the degree of postoperative pain relief obtained would be the amount of narcotic medication administered following surgery. The drug requirements of the treated patients when compared with those of the controls, would serve to establish this factor. Similar drug orders were written for all patients—to be administered when needed. There was no attempt to withhold medication. It should be remembered that many patients are extremely apprehensive prior to surgery and require sedative medication. The entire postoperative requirements were evaluated as a whole. When medication was administered an attempt was made to ascertain the exact basis for its need.

The results of this study are presented in Table I.

Discussion

The results of this study are impressive. Efocaine produced a high degree of postoperative analgesia and consequently freedom of pain in almost every instance. This is best demonstrated by the postoperative narcotic requirements of the group. Twenty-three patients received no medication during their hospital stay. Nine patients received one

Table I

THE CONTROL OF POSTOPERATIVE ANO-RECTAL PAIN

Case No.	Age Sex	Surgical Indications or Diagnosis	Amount of Efocaine Injected (cc.)	No. of Doses of Postoperative Medication Required	Degree of Pain Relief Obtained	Remarks
1.	24M	Combined Hemorrhoidectomy, Infected Anal Ducts & Fissure.	3	2 Doses	No Relief	3 cc. of Efocaine is not enough to control pain in a sensitive patient; catheterized once.
2.	27F	Combined Hemorrhoidectomy, Infected Anal Ducts, Fistula and Fissure.	10	None	Complete	Catheterized the same day of surgery; no medication.
3.	28F	Combined Hemorrhoidectomy, Infected Anal Ducts.	5	None	Complete	No pain and no medication following surgery.
4.	39M	Combined Hemorrhoidectomy, Infected Anal Ducts & Rectal Abscess.	10	1 Dose	This patient very sensitive. Good.	Patient on the verge of a nervous collapse. Medication same day of surgery.
5.	23F	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	2 Doses	Complete	Medication day of surgery.
6.	41M	Combined Hemorrhoidectomy, Infected Anal Ducts, Pruritus Ani.	10	2 Doses	Complete for five days.	Patient was reinjected with 10 cc. of Efocaine five days after surgery; catheterized day of surgery.
7.	31M	Internal Hemorrhoidectomy and Infected Anal Ducts.	10	1 Dose	Complete	Medication given day of surgery.
8.	40F	Fistula-In-Ano.	10	None	Complete	Catheterized day of surgery but required no medication.
9.	25F	Combined Hemorrhoidectomy, Infected Anal Ducts and Fissure.	10	None	Complete	No pain or medication.
10.	38F	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	None	Complete	No pain or medication.
11.	51M	Combined Hemorrhoidectomy, Infected Anal Ducts & Pruritus Ani.	10	None	Complete	Anesthesia began to wear off at end of seven days, reinjected 10 cc., no pain.
12.	29M	Combined Hemorrhoidectomy, Infected Anal Ducts and Fistula.	10	None	Complete	No pain, back to work in two weeks.
13.	24F	Combined Hemorrhoidectomy, Infected Anal Ducts & Pilonidal Cyst.	10	2 Doses	Slight pain on dilations.	Medication and catheterization day of surgery.
14.	39M	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	1 Dose	Good	Patient had a third degree prolapse of internal hemorrhoids, did not require medication until five days after surgery. Developed an anxiety reaction and was treated by psychiatrist.
15.	26M	Combined Hemorrhoidectomy, Infected Anal Ducts and Fistula.	10	1 Dose	Good; nervous reaction.	Catheterized once; medication day of surgery.
16.	24F	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	4 Doses	Good; nervous reaction.	Catheterized day of surgery, medication first two days following.
17.	28M	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	4 Doses	Good; nervous reaction	Catheterized day of surgery, medication given first and third days after surgery.
18.	41F	Combined Hemorrhoidectomy, Infected Anal Ducts and Fissure.	10	1 Dose	Complete	Pain day of surgery, none thereafter.
19.	39F	Combined Hemorrhoidectomy, Infected Anal Ducts and Fissure.	10	6 Doses	Complete	Patient an alcoholic. Hospital gave her medication as a control measure. She stated that she had no rectal pain.
20.	36M	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	5 Doses	Fair	Patient became extremely nervous before surgery, required medication first three days after surgery.
21.	14F	Combined Hemorrhoidectomy, Infected Anal Ducts and Fissure.	10	None	Complete	Patient very nervous and neurotic but required no medication.

THE CONTROL OF POSTOPERATIVE ANO-RECTAL PAIN (Continued)

Case No.	*Age Sex*	*Surgical Indications or Diagnosis*	*Amount of Efocaine Injected (cc.)*	*No. of Doses of Postoperative Medication Required*	*Degree of Pain Relief Obtained*	*Remarks*
22.	70M	Combined Hemorrhoidectomy, Infected Anal Ducts and Crypts.	10	None	Complete	Relief to extent that patient was "running around" on second day.
23.	85M	Combined Hemorrhoidectomy, Infected Anal Ducts and Crypts.	10	None	Complete	No pain or medication.
24.	68F	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	None	Complete	No pain or medication.
25.	38F	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	1 Dose	Almost complete.	No pain.
26.	40F	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	1 Dose	Almost complete.	No pain, medication given before first BM as precaution.
27.	39F	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	None	Complete	No pain or medication.
28.	44M	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	1 Dose	Almost complete.	No pain, medication given as precaution before first BM.
29.	45M	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	1 Dose	Almost complete.	No pain, medication given as precaution before first BM.
30.	39M	Combined Hemorrhoidectomy, Infected Ducts, Pruritus Ani.	10	None	Complete	No pain, medication given as precaution before first BM.
31.	40F	Combined Hemorrhoidectomy, Infected Anal Ducts and Fissure.	10	None	Complete	A tab was nipped off five days after surgery without any feeling to patient.
32.	30F	Pruritus Ani.	10	None	Complete	Patient injected in office following undercutting operation for pruritus ani. Complete relief.
33.	35M	Ulcerative Colitis.	10	None	Good	Patient received great deal of relief of rectal pain caused by diarrheal disease.
34.	81F	Combined Hemorrhoidectomy, Infected Anal Ducts and Fissure.	10	None	Complete	Patient injected prior to dilation, complete relief.
35.	48F	Pruritus Ani.	10	None	Good	Patient extremely neurotic, some relief, still complained.
36.	40F	Fissure-in-ano.	10	None	Complete	Fissure healed.
37.	45F	Combined Hemorrhoidectomy, Infected Anal Ducts.	10	None	Complete	No medication or catheterization necessary.
38.	43M	Pruritus Ani.	10	None	Good	Patient relieved of itching but still greatly inflamed on last visit. Not an operative case.
39	40F	Multiple Fissures.	10	None	Complete	Fissures Healed.
40.	28F	Referred postoperative case; Injected to Dilate.	10	None	Complete	Dilations without pain.

dose of postoperative medication. This was administered to four prior to the first bowel movement as a precautionary measure; four were extremely apprehensive and were given sedative medication on the first day of surgery. One patient had an anxiety reaction on the fifth postoperative day which required psychiatric care, and medication was administered at this time.

Of the four patients receiving two doses of narcotic medication two were extremely apprehensive, one had pain on dilation and one patient was injected with only three cc. of Efocaine, which is not enough to entirely block the perianal region. Four patients required more than two doses of postoperative medication. One, an alcoholic, was administered sedatives as a control procedure; the others developed severe anxiety reactions which required sedative medication. It is important to recognize that almost all of the postoperative medication was administered on the day of surgery and for reasons

other than pain in the operative area.

In summary, 32 of the patients (80 per cent) received none or one dose of postoperative medication; four (or 10 per cent) were given two doses and four (10 per cent) more than two doses. An analysis of control patients undergoing identical surgery reveals that the average patient requires medication for at least four days, which again accents the pain relief afforded by prolonged local anesthesia.

Six of the patients (15 per cent) were catheterized and *all on the first day of surgery.* This best serves as an objective confirmation of the anesthetic activity and pain relief afforded since Johnson and Schilla[13] reported in their survey that in a series of 100 ano-rectal cases, 66 per cent required catheterization at least once, 20 per cent were catheterized twice, and nine per cent three or more times.

Local anesthesia was generally present for more than 10 days. In one instance its effects began to wear off after five days; in another after seven days. These patients were reinjected with Efocaine, which again produced prolonged anesthesia. Sphincter control was normal in all instances. It is of interest to note that a greater flexibility in the postoperative care exists because of the prolonged anesthesia. The patients generally felt better and early ambulation was promoted.

There were no untoward reactions observed in any of the patients. There were no local tissue reaction, sloughs, or abscesses, as have been observed with the oils.

Our experiences with this drug have been most satisfactory. Its proper use in proctology will result in an alleviation of much of the postoperative ano-rectal pain.

Summary and Conclusions

1. The scope of Efocaine as a means of controlling postoperative ano-rectal pain was evaluated in a series of 40 patients.

2. A dramatic relief of postoperative pain was observed in almost every instance, and postoperative narcotic requirements were virtually eliminated.

3. There were no local tissue reactions nor any untoward effects observed in any of the patients.

4. This drug is an effcetive means of pain control and is worthy of routine use in ano-rectal surgery.

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CHANGE OF ADDRESS

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BLUE SHIELD

Doctors Get Good Score

Doctors in general and their competent services in particular got a good score from Blue Cross-Blue Shield members throughout Kansas during recent Member Council Meetings. The Member Council Meetings are scheduled in the spring and fall each year. Nine separate meetings are held so that a representative group of members meet in each part of the state. Over 150 attended the nine meetings.

Questionnaire

One innovation in this spring's series of meetings was a carefully prepared questionnaire which contained some 25 questions on various aspects of the Blue Cross-Blue Shield program.

One of the questions concerned the attitude of members toward the medical profession. The question read as follows:

"How Do You Feel About Your Doctors?"

In analyzing the returns, it was found that out of the 97 people answering the question, 74 people indicated a favorable opinion of doctors, whereas 23 had certain reservations. Some of the actual answers may prove interesting. They are quoted below.

"I Love Mine"

"Our doctors are fine, but I feel they should appreciate Blue Shield more and do more to help members understand it."

"Personally, I think they are all right; as a group they do not sufficiently support their own plan."

"Never get to see one, due to waiting lines most of them are overworked."

"Some doctors are very cooperative, while others want to charge farmers against their gross income."

"Doing all they can for Blue Cross and Blue Shield."

"In our town I think their prices are too high."

"Too far from local community to make calls in the country."

"One rural doctor for entire north half of county, results in more hospitalization."

"More or less independent."

"Half of them don't cooperate with hospitals as fully as they should."

"Doctors are fine but we need more of them in our town. The doctors at present are not specialists in everything."

"Sometimes I don't feel like they do all they can. Just too busy with all concerned."

"Excellent, both in ethics and service."

"Overworked, too many specialists expect too much of the average person."

"Doing a splendid job."

"The doctors are very busy, necessitating a long wait in the office."

"Our town's blessed with good doctors."

"Do not have enough doctors who can or will make home calls."

"Doctors should be better informed on Blue Cross in addition to Blue Shield."

Rocket Research Delayed for Drug Production

The Army Ordnance Corps is voluntarily deferring deliveries of a chemical compound called hydrazine, being experimented with as a rocket propellant, so that more of it may be used to produce new drugs which have brought dramatic improvement in tuberculosis patients. Announcement of the arrangement was made recently by the Department of Defense.

Recent publicity has told of the promise given by a family of new anti-tuberculosis drugs, an essential part of which is hydrazine. Tests are being conducted at New York hospitals on more than 200 tuberculosis patients, many whose cases appeared to be hopeless. While the drugs are not considered a cure, results of tests have been encouraging and almost all of the 200 patients have shown improvement.

No volume production of hydrazine was undertaken until 1946, when Army Ordnance sponsored large-scale manufacture of the compound by the Mathieson Chemical Corporation of Niagara Falls. A production base for the compound was thus established, and the corporation is now the principal supplier of hydrazine in the United States.

Cancer Conference in Wichita

The Fourth Annual Mid-West Cancer Conference, held at Wichita, April 3 and 4, attracted an attendance of about 275 physicians. Although most were from Kansas, registration records show that doctors attended from Nebraska, Missouri, Oklahoma and Michigan also.

All of the scientific papers presented at the conference will be published in a bound issue which will be mailed to all members of the Kansas Medical Society as a supplement to the Journal.

Over 80,000,000 people have thought of hospital care at a time when they are not ill, reported Dr. Anthony J. J. Rourke, president of the American Hospital Association, at a recent Blue Cross and Blue Shield conference. That number of people carry hospital coverage today.

PRESIDENT'S PAGE

Dear Doctor:

Another very notable year in the history of the Kansas Medical Society has gone into the record. The history of the Kansas Medical Society is definitely one of continued worthwhile achievement throughout the years, and the year just closed has been no exception to the rule. Under the devoted and skillful guidance of Dr. Benage it has taken its place in our history and will be remembered as a year of achievement and advancement.

One of the really great and worthwhile attributes of our organization is the imperturbability of the membership as typified by the working physician and his determination to devote himself wholeheartedly, sincerely and unselfishly to the health of the people of Kansas and to dedicate his life to the accomplishment of worthwhile goals in the public interest.

We hope during the coming year to be able to live up to and to reflect the great traditions which have been so admirably set up by those who have preceded us through the years. We hope definitely to give of ourselves and our time unstintingly in order that a fully developed program of public relations and education may be developed and be a reality to the people of Kansas and to our membership. Also, we will expect to concern ourselves as a Society with political activity in its highest American tradition, in order that we may obtain and preserve those things which are best for our people and ourselves and our profession, either local or national. We have the firm conviction that the great American traditions which have made this country the most remarkable country in history are worth saving and worthy of every individual's effort who is privileged to live within our boundaries.

We expect to continue to cooperate with our closely allied professions with whom we have built up a very enviable relationship. It is our opinion that the policies underlying the formation of this group and the goals which they have set for themselves are worthy of the continued consideration of the Society. Great progress can be accomplished if we have the cooperation of officers, committees and members. I humbly bespeak of you such cooperation.

EDITORIAL COMMENT

Editor Resigns

Dr. Lucien R. Pyle resigned as editor of the Journal upon his election to the position of president-elect of the Kansas Medical Society on May 1, 1952. This change will become effective with the next issue.

Dr. Pyle has been editor of this Journal for six years. Even a brief review of the issues published under his direction will immediately reveal many changes that have taken place during this period. The Journal has become larger with more scientific material included. New departments have been added, and in general the official publication of the Kansas Medical Society has expanded its influence.

In recognition of outstanding services, the Society gave Dr. Pyle the highest honor which is in its power to bestow upon a physician in this state. This honor, richly deserved, not only for his work as editor, his contributions to the council, his outstanding achievements as chairman of the Kansas Volunteer Advisory Committee, comes also as a tribute to an eminent physician and to a remarkable gentleman whose qualities of leadership and whose absolutely uncompromising integrity have made him admired and respected by all who have met him.

He has a combination of qualities which are rarely found in persons outside the field of medicine, and is distinguished even within his own profession. This combination embodies many things, but immediately noticeable is a balance between the ability to evaluate fact without bias, to appreciate people for what they are, and to practice the idealism upon which medicine is founded. Those qualities have made him a splendid editor, but give promise to provide the Kansas Medical Society in the near future with an equally capable president.

Readers of the Journal will miss his many contributions, but upon the completion of this service to his Society he will enter into a sphere of broadened influence. The Editorial Board takes this opportunity of expressing its thanks, with those of the medical society, to Dr. Pyle and wishes him continued success in his new responsibilities during the years to come.

The new editor elected by the council will be Dr. Orville R. Clark, Topeka, who has served on the Editorial Board for many years. Everyone familiar with Dr. Clark and his serious acceptance of responsibility knows the Journal is in most capable hands. There is no doubt in the minds of everyone but that the Journal will continue to progress and will continue to increase its importance to the physicians of this state. Dr. Clark, besides performing many services for the Journal, has for three years accepted full responsibility for the publication of the annual cancer supplement. The Journal, therefore, is very proud to have Dr. Clark become editor and is further pleased to announce that Dr. David E. Gray of Topeka will succeed to the vacancy on the Editorial Board created by the resignation of Dr. Pyle.

Annual Session in Kansas City

The 93rd annual session of the Kansas Medical Society is closing just as the deadline arrives for this issue of the Journal. Therefore, official proceedings and a more detailed account of the activities at this meeting will be published in the June issue. For the present, the following are a few outstanding recollections of this event.

Dr. Lee H. Leger, general chairman, the state meeting committee, and the entire Wyandotte County Medical Society were magnificent hosts. They had planned all activities of the convention with such care that each event proceeded on schedule and without outward difficulty. The Kansas Medical Society wishes to express its gratitude to the Wyandotte County Society for a splendid meeting.

Although physical facilities in the meeting hall were not completely adequate for the needs of the meeting, everyone accepted these inconveniences and discovered that the session proceeded far better than anticipated. For example, the exhibit hall was crowded, but instead of this factor presenting an obstacle, it became an asset in that the narrow aisles gave every physician a better opportunity of visiting all persons who exhibited. The excellence of the scientific program did much to erase the memory of a long climb to the meeting hall. Therefore, the physical facilities were no barrier to the general success of this meeting.

All events were well attended and apparently enjoyed. Five hundred fifteen members of the Kansas Medical Society registered for this meeting. In addition there were almost 300 medical students from the University of Kansas and guest physicians. Adding to this the members of the Kansas Medical Assistants' Society and of the Auxiliary who attended this convention, the total came to almost 1,200. Even the weather cooperated to bring a week of sunny skies, which quickly erased the flood threat that appeared imminent the week previous.

Dr. Clarence H. Benage concluded a memorable year as president of the Society and presided over all business functions as well as at the annual banquet, which featured an evening of entertainment

by way of dancing. An incidental surprise pleasure occurred during the banquet in the visit of Dr. George M. Gray, 96-year-old past president of the Kansas Medical Society.

The meeting closed with the election of officers, which gave the Society the following leadership for the coming year:

Warren F. Bernstorf, M.D., Winfield, President

Lucien R. Pyle, M.D., Topeka, President-Elect

Murray C. Eddy, M.D., Hays, First Vice President

John M. Porter, M.D., Concordia, Second Vice President

Dale D. Vermillion, M.D., Goodland, Secretary

John L. Lattimore, M.D., Topeka, Treasurer

Laurence S. Nelson, M.D., Salina, Delegate to the A.M.A.

George F. Gsell, M.D., Wichita, Alternate to the A.M.A.

The Society also elected councilors to fill four places for those whose terms had expired. Among these, Dr. Clyde W. Miller, Wichita, is a new member, serving on the council for the first time. Dr. Lloyd W. Reynolds, Hays, having been previously appointed to fill a vacancy, was elected to his first term. The other two, Dr. James G. Hughbanks, Independence, and Dr. Robert G. Klein, Dodge City, were elected to second terms.

Plans have already been made for the 1953 meeting, which will be held at Wichita, May 3 to 7, 1953, and will be a special occasion in that Wichita will be celebrating the 50th anniversary of the organization of the Sedgwick County Medical Society.

Hospital Costs

During these days of rising costs some criticism has arisen over the increased cost of illness. Hospital care accounts for a considerable portion of this, and in an effort to establish a better picture of this situation there has been created a Commission on Financing of Hospital Care. This is of special interest to both the American Hospital Association and the American Medical Association and will bring together a staff of experts in numerous fields. The story of this effort is of interest in that it proposes to analyze much information regarding the cost of illness. It appears this work will be done thoroughly because the commission has many well known names and a budget of one-half million dollars with which to work.

The commission proposes to study a series of basic questions. One will be an evaluation of the present financial status of hospitals. This involves a consideration of the source of income as well as business practices of hospitals. The second phase considers the need and demand for hospital services, where the commission will explore the areas surrounding minimum facilities for maximum usage. An attempt will be made to correlate supply and demand.

A third pertains to the effect of medical practice on hospital costs, where such questions as why physicians hospitalize patients will be studied and whether medical research should be conducted in hospitals. In their own words they state, "The functional relationship of the hospital and the physician should be clarified with a view toward more effective and economical use of equipment and personnel."

The next subject is an exploration toward determining how high quality services may be obtained at lowest possible cost. The fifth is an evaluation of systems of payment for hospital care; sixth, the utilization of hospital resources, and seventh, recommended changes which appear desirable as a result of this study.

If properly conducted, this appears to be a worth while undertaking and one in which the medical profession and hospital administrators may well cooperate, not only on national but at state and local levels as well. It is a common problem which, if solved satisfactorily, can materially aid in answering current criticism.

Even on the surface this is a complex situation. During the years 1946 to 1950, 660 hospitals have been built in the United States and an additional 20,000 hospital beds have been added at an investment of one billion dollars. Along with that, more people are using hospitals. Twenty-one per cent more people were hospitalized in 1950 than in 1946, but the average length of stay was reduced 15 per cent. Expenses have risen. The per patient day costs in 1946 were $9.39. In 1950 they were $15.62, showing an increase of 66 per cent. In that same period, the patient income to hospitals had risen 69 per cent. At the same time, however, hospital costs rose even more rapidly so that the hospitals in the United States lost $1.64 per patient day in 1946, but even at the higher rate of pay the hospitals lost $2.51 per patient day in 1950.

Five years ago payroll accounted for 53 per cent of hospital expenditures. Today it is 56.7 per cent. It has been learned that the number of persons employed per 100 patients admitted has continually risen from 148 per 100 patients in 1946 to 178 in 1950.

The rapidly expanding insurance programs such as Blue Cross seem further to complicate the picture. Blue Cross growth has been steady and gratifying, but the average use rate has consistently risen, so the expansion of this program presents another problem to the hospital.

In Kansas this is of particular interest because the admission rate is considerably above the national

average. In 1949, 118 of every 1,000 Blue Cross members were hospitalized in the United States. In Kansas that figure was 136. The national figure in 1951 was 123, but in Kansas had jumped to 157. Therefore, even though the average stay is short, the increase in usage more than upsets that advantage. It is dramatically expressed by Kansas Blue Shield as follows: As previously stated, the use rate in this state is greater than the national average, but the average length of stay is shorter than the national average. The end result, however, is that Blue Cross members in Kansas used 74,400 more days of hospital care than they would have used on the basis of the national average.

All this is only an example to illustrate the magnitude of this problem. It is sincerely hoped that the commission can progress rapidly, and if this study may result in a discovery of means for providing adequate health care to the public at reduced cost, those suggestions will be most welcome to the medical profession in this state. The Kansas Medical Society will be pleased to cooperate with the Kansas Hospital Association should any portion of this undertaking be directed to a study of the situation in this state.

COUNTY SOCIETIES

Members of the McPherson County Society were hosts at a meeting held at McPherson March 13 for members of the Harvey and Marion County societies. A paper, "A Psychiatric Viewpoint in the Practice of Medicine," was read by Dr. Allan J. Enelow of the state hospital at Topeka.

* * *

The February meeting of the Sumner County Medical Society was held at Wellington. Three speakers from Topeka presented the evening's program, Mr. Oliver E. Ebel of the Kansas Medical Society, Mr. Sam J. Barham of Blue Cross and Blue Shield, and Dr. Thomas Hood of the Kansas State Board of Health.

* * *

Dr. Fowler Poling and Dr. Louis Morgan, both of Wichita, were speakers at a meeting of the Cowley County Society held in Arkansas City late in March. Their papers were on the subject of mental illnesses.

* * *

Dr. Paul Grubb of Galena was elected president of the Cherokee County Medical Society at a meeting held in Galena late in February. Dr. Frank James, Galena, was named vice president, and Dr. V. Dale Alquist, Baxter Springs, was chosen secretary.

Members of the Geary County Society were hosts to the Golden Belt Medical Society at a meeting held at the Junction City Country Club on April 3. The afternoon scientific program was presented by Dr. Joseph H. Pratt, Rochester, Minnesota, who spoke on "Malignancies of the Cervix and Fundus," and Dr. William L. Valk, Kansas City, whose subject was "Clinical Significance and Management of Hematuria." A dinner session and social hour followed.

* * *

Members of the Southeast Kansas Medical Society met at the Chanute Country Club on March 12. Dr. Robert Newman, of the University of Kansas Medical Center, spoke on "Common Gynecological Lesions."

* * *

A meeting of physicians of the mid-west Kansas area was held at the Park Hills Country Club, Pratt, April 4. Dr. M. E. Christmann, president of the Pratt County Society, presided and introduced the speaker, Dr. Maxwell Allen of the University of Kansas Medical Center. Dr. Allen discussed treatment of hyperthyroidism and the use of radioactive iodine.

* * *

The February meeting of the Dickinson County Society was held at Enterprise. Speaker of the evening was Mrs. Russell C. Foster, Topeka, who spoke on Blue Shield and answered questions about the plan.

* * *

Dr. Kenneth W. Warren of the Lahey Clinic, Boston, was speaker at the March meeting of the Sedgwick County Society. His subject was "A Panoramic View of Pancreatic Surgery." At the April meeting of the society, Dr. Thomas B. Fitzpatrick, of the University of Michigan, Ann Arbor, spoke on "Pigmentation."

* * *

The March meeting of the Shawnee County Society was held at the Jayhawk Hotel on the fourth. Dr. R. M. Shick, of the Mayo Clinic, Rochester, Minnesota, spoke on "Diagnosis and Treatment of Periarteritis Nodosa."

Important messages are presented in the advertisements in our Journal each month. New products are announced from time to time, and information is presented regarding the use of products featured. Other types of ads emphasize services rendered and commodities offered that may be used in your practice, in your office and in your home. You can rely on the statements and facts presented. We include only ethical advertisements in our Journal. Please tell advertisers that you saw their ads in the Journal of the Kansas Medical Society.

Case Report From The University of Kansas Medical Center

Clinical Pathological Conference

Edited by Glen R. Shepherd, M.D., and Mahlon H. Delp, M.D., from recordings of the conference participated in by the departments of medicine, pathology, pediatrics, radiology, and urology, and the junior and senior classes of medical students.

Case Presentation

S. L. H., a 5½-year-old girl, was admitted to KUMC on September 1, 1951, with swelling of the face, abdomen, legs, and knees and ascites which began in July, 1951. She was placed in a local hospital in August, 1951. There was slight fever at the time of her hospitalization but none for two weeks previous to admission to this hospital. Her parents thought she had never had an elevated blood pressure. There had been blood and albumin in her urine. Her weight was 62 pounds on August 1 and 71 pounds on August 25.

The patient had had an illness in February, 1951, which was diagnosed as pneumonia. There were no illnesses between February and July.

Her past history and family history were noncontributory.

Physical examination showed a well developed pale child 5½ years of age with massive edema who appeared chronically ill. The eyelids were edematous and swollen nearly shut. Fundi were negative. ENT was negative. Heart sounds were good. Her PMI was in the fifth intercostal space midclavicular line. There were no murmurs. Blood pressure was 115/80. Both lung bases were dull up to the sixth intercostal space, but the lungs were clear to auscultation. The abdomen was markedly swollen with shifting dullness and a fluid wave. There was four plus pitting edema of the lower extremities with two plus pitting edema of the upper extremities. The skin over the entire body pitted on pressure. Neurological examination was negative.

Laboratory examination showed the following: Voided and catheterized urine specimens showed essentially the same findings. Specific gravity varied from 1.005 to 1.018. Albumin on admission was four plus and varied from a trace on September 5 to two plus on September 7. Sugar was negative. Pus cells in the urine, only four to eight on admission, were 21,000 per cu. mm. on September 8. Red blood cells were numerous in the urine on September 1, but only an occasional one was seen September 7. Occasional granular casts with an occasional pus cast and hyaline cast were noted in every urine examination.

On September 1, the complete blood count showed 3,250,000 red blood cells; hemoglobin 9.0 grams; 10,100 white blood cells of which 59 per cent were polys, 35 per cent lymphocytes, and five per cent monocytes. The NPN was 80 mgm. per cent, serum chloride 80 meq. and cholesterol 1028 mgm. per cent. Total protein was 4.71 grams with globulin 2.02 and albumin 2.69. Nose and throat cultures revealed only normal flora. Urine culture was negative.

On September 5, the complete blood count showed 4,890,000 red blood cells; hemoglobin 13.3 grams; 7,950 white blood cells of which 74 per cent were polys, 20 per cent lymphocytes, and six per cent monocytes. Wassermann was negative. The NPN was 67 mgm. per cent, and the cholesterol 1024 mgm. per cent.

On September 8, the NPN was 73 mgm. per cent, serum chloride was 108 meq. and the cholesterol was 1216 mgm. per cent.

Paracentesis fluid showed a specific gravity of 1.011. Protein was 40 mg. per 100 cc. Thorn test showed 211 eosinophiles initially, dropping to 30 eosinophiles four hours after adrenalin administration.

Hospital course: The patient was placed on bed rest, high protein and low salt diet. Temperature was normal on admission and weight was 69 pounds. The daily urine output was approximately 400 cc. Dysuria was noted by the patient on September 5 and chloromycetin was given, 250 mg. every four hours. The blood pressure remained around 110/70 and her weight about 67½ pounds. She was given two blood transfusions of 250 cc. each. A paracentesis was done on September 7 with 1150 cc. of clear fluid being obtained. The puncture site continued to drain.

She was discharged on September 8 and followed as an outpatient in Kansas City. She was given a mixture of Darrow's solution (potassium and sodium chlorides and sodium lactate) in ginger ale 1:3 to take for several days after dismissal to replace the salt lost suddenly in the ascitic fluid and thus avoid an acute salt depletion syndrome. Her weight on discharge was 65 pounds.

On September 14 she was feeling well except for some leg aching. Salt was continued in her diet and she was sent home to Wichita. Her weight was 57 pounds at that time.

Laboratory work done on September 14 showed

an NPN of 80 mgm. per cent, sodium 127 meq., potassium 4.9 meq., and chloride 108 meq.

The patient was readmitted on September 25. She had ceased having drainage from the paracentesis site nine days before and had gained 13 pounds. The complaint at the time was pain and tenderness in her skin which was quite distended with edema fluid. Although appetite was good previously, vomiting during the night began September 24. A slight possibly productive cough had lasted several days without fever. Urine output had been good.

Physical examination showed a chronically ill child who appeared uncomfortable with a generalized anasarca but not critically ill. The eyes, ears, nose and throat were negative. The neck had slight palpable nodes bilaterally. Chest was symmetrical with bilateral shotty axillary nodes. Dullness and tubular breath sounds were heard in the right apex anteriorly. The lungs were otherwise clear, although the diaphragm was elevated bilaterally. Blood pressure was 110/58. The heart showed normal sinus rhythm with sounds slightly distant but no murmurs. The abdomen was protuberant and exhibited a fluid wave. No pitting edema was noted in the upper extremities but there was four plus pitting edema in the lower extremities.

Laboratory examinations showed the urine to have a specific gravity of 1.024, acid reaction, with one plus albumin and 0.5 per cent sugar. There were many granular and hyaline casts, and 2-4 red blood cells, and 4-6 pus cells per high power field. The complete blood count showed 3,820,000 red blood cells; 11.8 grams hemoglobin; 8,900 white blood cells of which 71 per cent were polys (59 filamented and 12 non-filamented), 25 per cent lymphocytes, and four per cent monocytes. A chest x-ray was taken.

Hospital course: The patient's temperature was 99.2° F. on admission and rose to 102.4° F. by 11:00 p.m. She continued to be uncomfortable. A paracentesis was done at the time of admission, yielding 1200 cc. fluid under pressure. About 10:00 p.m. an erythematous rash developed over the right lower extremity and in a small area on the left thigh. At 4:30 a.m. of September 26 she became more restless and dyspneic, although she was rational and alert. At that time the chest was clear to auscultation despite cyanosis and some flaring of the nostrils. Oxygen was started. Almost immediately respiration became slow and grossly irregular and the patient became unresponsive. A blackish vomitus appeared, and after a few sighing respirations the patient ceased to breathe.

Dr. Mahlon H. Delp (Chairman): Are there any questions of Dr. Fairchild?

Question: Was purpura noticed?

Dr. Robert Fairchild (Pediatric Resident): This rash didn't look like a purpuric rash. It looked like an erythematous splotchy rash.

Question: Was splenomegaly present at any time?

Dr. Fairchild: No.

Question: Were antibiotics administered?

Dr. Fairchild: She had received chloromycetin on her first admission. On her second admission she had no antibiotics.

Question: Was cortisone or ACTH given?

Dr. Fairchild: No.

Dr. Delp: Do you think the patient had any cardiac symptoms?

Dr. Fairchild: No.

Dr. Delp: You didn't think she had congestive heart failure?

Dr. Fairchild: No, we didn't, Dr. Delp.

Dr. Delp: Dr. Tice, you have one x-ray to show.

Dr. Galen M. Tice (Radiology): This was made during the second admission, on the 25th. It shows an opaque right pleural cavity with some relative opacity intermedially. The picture is that of fluid in the pleural cavity, but not enough to push the heart over appreciably. The left lung was relatively clear. This film nicely shows the marked edema of the soft tissues that has been described.

Dr. Delp: Don't you think, Dr. Tice, it is unusual to find fluid on one side only in this case?

Dr. Tice: Yes, unless she was lying on that side.

Dr. Delp: Was this child lying on the right side all the time?

Dr. Fairchild: No, she was lying flat on her back.

Dr. Delp: Mr. Diehl, may we have your discussion.

Differential Diagnosis

Mr. Leonard Diehl (Medical Student): The pneumonia in February could very easily have significance in this case. First of all, I want to rule out some rather unlikely diagnoses that should at least be mentioned. The high blood cholesterol suggests such lipoid diseases as Gaucher's disease. But that doesn't seem to fit at all because there is no record of splenomegaly, or of adenopathy, leukopenia and thrombocytopenia, although these often occur in Gaucher's disease. Furthermore, the cholesteremia wouldn't be as marked as it was in this case.

Niemann-Pick disease is also ruled out for almost the same reasons. Hands Schuler Christian disease is a lipoid disease having cholesterol as the fat involved. However, hepatomegaly, splenomegaly and often pancytopenia occur in that disease but were not noted in this case.

The ascites suggests tuberculous peritonitis. How-

ever, the other findings do not support such a diagnosis.

A nephrosis is a good diagnostic possibility. There are several kinds of nephrosis such as the nephrotic syndrome associated with chronic glomerulonephritis. Whether or not lipoid nephrosis is a separate entity is a point disputed by several authorities. Other nephroses include amyloid nephrosis, luetic nephrosis, and nephrosis associated with the collagen diseases. However, the protocol does not support either amyloid nephrosis or the collagen diseases.

Two other diagnostic possibilities remain. Familial lipemia is a very rare thing. There is no familial history of it in this case. Also, lipemia has a neutral fat elevation in the blood rather than cholesterol, even though the cholesterol is slightly elevated. Finally we might consider congenital polycystic disease of the kidneys. Usually that shows up a little earlier than this with more renal failure earlier than the present case showed. So that leaves us with a discussion of nephrosis.

Glomerulonephritis is a common disease of children. Two-thirds of those affected are under seven years of age. Most seem to be streptococcal in origin. However, about five per cent are pneumococcal. These present a different picture than do the streptococcal ones. In the group where the pneumococcus is the infective agent, there are more marked ascites and a greater element of the nephrotic syndrome. Also, it is usually associated with or develops after an upper respiratory infection or it may follow scarlet fever. This so-called pneumonia in February was about 4½ or 5 months prior to clinical symptoms possibly referable to the kidney. There have been cases where an acute upper respiratory infection was thought to have etiologic significance as long as six months before the onset of the nephrotic syndrome.

The nephrotic syndrome fits well with this clinical picture except that hematuria isn't too common in the nephrotic syndrome. Capillary damage does occur, however. In such a case, one would expect red blood cells in the urine. The erythematous or erysipeloid rash, usually a late sign in the nephrotic syndrome, also is thought to be due to capillary fragility. I didn't see anything in the protocol indicating cardiac failure although it is a fairly common complication of nephrotic syndrome. Sometimes found at autopsy are cloudy swelling of the muscles and loss of striations.

The child usually is not very sick with the nephrotic syndrome. This seemed to be the case in this child. At first she seemed to be fairly alert and wide awake. The absence of real fever, lack of elevation in blood pressure, the high cholesteremia and the elevated NPN are all findings supporting a diagnosis of nephrotic syndrome. I would call this probably sub-acute glomerulonephritis. However, it is hard to say just how long the nephritis had been going on. Many cases develop insidiously after no history of an upper respiratory infection, while only one per cent of those with glomerulonephritis became chronic. Some authors think there may be a different entity or etiology in chronic glomerulonephritis and acute glomerulonephritis. There is some disagreement about that.

Usually there is a more moderate elevation of cholesterol in lipoid nephrosis. Here again, no two authors agree exactly on the definition of lipoid nephrosis. When this patient was readmitted, she probably had an upper respiratory infection which may have been a lobar pneumonia. However, the elevation of the diaphragm on the right side would also suggest atelectasis. And since atelectasis sometimes can occur with allergies or with acute infectious episodes of the respiratory tract, this patient probably had some atelectasis even though the x-ray doesn't show definite evidences of such.

My final diagnosis is nephrotic syndrome with subacute glomerulonephritis. I think you will find evidence of lobar pneumonia with some atelectasis.

Dr. Herbert C. Miller (Pediatrics): I don't expect to do more than give my feelings as to what the terminal event in this child was. I think the possibility of an infection certainly is good. These children are highly susceptible to the pneumococcus. Pneumococcic septicemia, pneumococcic peritonitis, empyema and pneumonia are common in children with nephrosis. It is possible this child developed a sudden overwhelming sepsis and died. It is also possible that this child's pulmonary exchange was considerably hampered by the accumulation of fluid which you see on the right side. That is an intriguing thing because that fluid has been there for some time. She had signs of fluid on the right side at the time of her discharge from her first hospital stay. But it was causing her no trouble and she was getting along fine. The left side had remained clear all this time. I don't know why.

On the last day of life, considerable amounts of fluid were removed from the peritoneal cavity, which should have improved her pulmonary exchange. It should have given her more vital capacity. The presence of large amounts of ascitic fluid obviously impairs the movements of the diaphragm. I suspect that the removal of that fluid mechanically did improve her pulmonary function.

Another thing you have to remember about these children is that they already tend to have low blood sodium concentrations. This child had a sodium concentration of 127 meq. per liter on September

14. There is a feeling on the part of a good many people that low sodium concentrations in certain individuals with nephrosis are perfectly all right. Osmotic pressure within the cells is low and so is the osmotic pressure in the extracellular compartments. As you attempt to increase the sodium concentration, all you succeed in doing is produce edema. So, knowing this child had a sodium concentration of 127 meq. on September 14, one would wonder what the sodium concentration was at the time of readmission. We don't know. The removal of 1200 cc. of peritoneal ascitic fluid obviously is going to lower the sodium concentration in the body by considerable amounts.

One of the things that you do when you take out large amounts of ascitic fluid is to throw individuals into a low salt syndrome. It wouldn't surprise me at all that this girl might have been precipitated into a low salt syndrome at the time of the last paracentesis. This may have caused a rapid accumulation of fluid in the thorax—a more rapid accumulation than is visible in this x-ray—and perhaps reduced her pulmonary function even more than is indicated and might have been the terminal event.

Dr. Delp: I don't want to overemphasize this terminal episode, but Dr. Fairchild mentioned something that might or might not have been significant in your thinking with regard to this patient after oxygen was started. He said the patient began breathing very slowly. Or did you say irregularly?

Dr. Fairchild: Irregularly. Slowly and irregularly.

Dr. Delp: Do you think the oxygen administration had anything to do with it?

Dr. Fairchild: No. Several events happened at the same time. Her head was elevated so that she was sitting practically straight up. The oxygen was started and then her breathing became slow and irregular. She vomited shortly thereafter. I think perhaps it is coincidental.

Dr. Delp: Dr. Reissmann, do you have any thoughts regarding this terminal situation?

Dr. Kurt Reissmann (Medicine): I don't think that it was related to the oxygen respiration. There was no reason to assume that there was decreased carbon dioxide in this patient.

Pathology Report

Dr. Leland D. Stoddard (Pathology): I am not going to emphasize the terminal episode because I think there is little we can contribute in that regard. The important lesions are renal and those are almost the only ones that I propose to discuss. I shall present this case as an instance of lipoid nephrosis, and in the discussion, distinguish lipoid nephrosis from glomerulonephritis. However, I am aware of the arguments against separating the two diseases.

The only satisfactory explanation for the terminal episode we have is the presence of bilateral pulmonary atelectasis. This resulted from bilateral hydrothorax, a part of the anasarca. We looked for such bacterial infections as peritonitis and pneumonia but were not able to demonstrate them.

Regarding the renal lesions, all of the proximal convoluted tubules are dilated. In certain places where the epithelial cells have died and are sloughing off, the tubules are lined by a thin layer of regenerated cells. Swollen tubular epithelial cells contain fat in the cytoplasm (Figure 1). Most of it

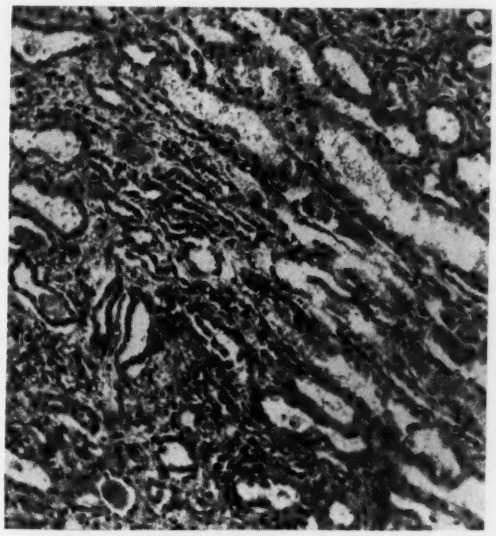

Figure 1. On the right, renal tubules lined by swollen epithelial cells containing fat; desquamated cells in the lumina. On the left, hyaline casts in distal convoluted tubules.

stained by the Sudan method, but very little if any was evident by polarized light. In the interstitial tissue there is edema and a chronic mononuclear inflammatory reaction. That, combined with the swelling of the tubules, accounts for the enlarged, swollen and opaque kidneys. That is all I want to say about tubular lesions because I want to emphasize the glomerular lesions.

Many of the glomerular capillary loops are entirely normal, but in some glomeruli capillary basement membranes are thickened and occasionally reduplicated. There are a few adhesions between capillaries and Bowman's capsule (Figures 2 and 3). There is no abnormality of the arterioles.

What are usually the early renal lesions in lipoid nephrosis? They are just what you have seen, namely, thickened basement membranes, a few capillary adhesions and only focal epithelial proliferation. Functionally, the glomerular capillaries

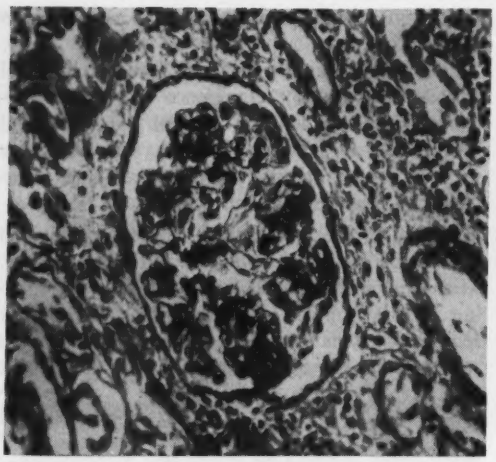

Figure 2. Most glomerular capillary basement membranes are normal. A few near the periphery are thickened. Interstitial edema and a mild interstitial mononuclear reaction between renal tubules.

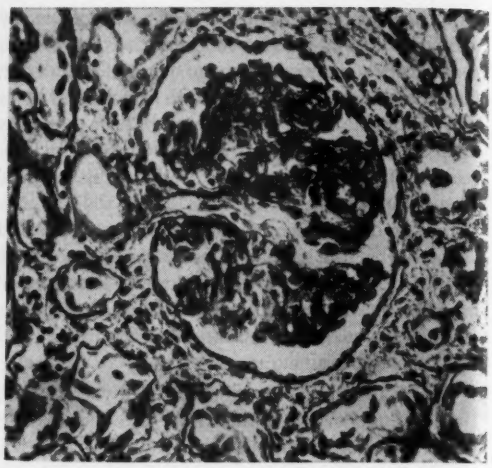

Figure 3. Many glomerular capillary basement membranes are thickened. Above, capsular adhesions and mild epithelial proliferation.

remain patent during the early stages. I think the tubular lesions are not primarily important. They are probably a consequence of increased glomerular permeability and of hyperlipemia. The interstitial reaction is variable. There is usually edema, and there may be a few mononuclear inflammatory cells infiltrating the interstitial tissue.

What urinary findings can we correlate with those lesions? There is some damage to the glomerular capillaries and to their basement membranes so that great quantities of albumin appear in the urine. That is responsible for protein casts. There were many protein casts in these tubules. On occasion even red blood cells filter through and appear in the urine. In this case, red cells were found in the urine, and they are seen in histologic sections of the tubules. The tubular changes are probably responsible for the fatty and cellular casts.

I think these renal lesions and the alterations in renal function explain many but not all of the elements known clinically as the nephrotic syndrome. There is a predictable relationship between lowered serum albumin and hyperlipemia, but I cannot explain that phenomenon.

Certain physiological alterations occur in the acute stage of glomerulonephritis but are absent or inconspicuous in the acute stage of lipoid nephrosis. These are hematuria, azotemia and hypertension. In this case there was not complete absence of hematuria nor of azotemia nor of mild hypertension. But these abnormalities, I should say, were not conspicuous. Dr. Miller, do you agree or disagree with me?

Dr. Miller: Well, I don't know what you mean when you say hematuria is unusual in these children. If they go on to renal insufficiency as about half of them will, all of them will develop hematuria, azotemia, and hypertension.

Dr. Stoddard: I was speaking of the acute stage of the disease.

Dr. Miller: Well, what is the acute stage of a disease that lasts two years?

Dr. Stoddard: The first two, three, or four months.

Dr. Miller: In the first month or two you wouldn't expect to see hematuria, azotemia or hypertension in any degree.

Dr. Stoddard: So although the clinical findings fit lipoid nephrosis rather well, some aspects of this case raise a debated question: Should lipoid nephrosis be separated from glomerulonephritis as a clinical-pathological entity? In considering this problem certain other questions occurred to me.

First, do the early glomerular lesions of lipoid nephrosis differ sufficiently from those of an acute, diffuse, proliferative, exudative, hemorrhagic glomerulonephritis so that they are distinctive and recognizable? Many competent workers have answered that question affirmatively. The endothelial proliferation, exudation, and the crescentic epithelial proliferations of glomerulonephritis are lacking. These changes in acute glomerulonephritis cause glomerular capillary obstruction, which is probably responsible for azotemia and hypertension in the early stages of that disease.

If one can extrapolate from experimental work, these anatomical differences may be only reflections of different immunologic reactions to an injurious agent. That is a proposition which may or may not be valid. But even if it is valid, we are still permitted to separate the two because the reactions to the injurious agent are so different. After all, the reaction to injury is really the significant thing in a disease process.

Second, is there a sufficiently distinct clinical pathological entity characterized clinically by the nephrotic syndrome and pathologically by the glomerular and tubular lesions that you have seen today? My answer to that is yes, there is. Cases of this sort are found. Nevertheless, some confusing cases are difficult to separate from glomerulonephritis clinically.

In addition to lipoid nephrosis, other designations have been given this entity. Ellis, Evans, and Wilson consider the process inflammatory and call the entity Type 2 nephritis. Allen calls it chronic membranous or chronic lobular nephritis. It has been referred to as tubular nephritis. Since an understanding of the pathogenesis of glomerular lesions requires further study, the problem of designation cannot be resolved. If the lesions are thought to be inflammatory, "nephritis" is used in the designation. Thirty years ago Fahr described the glomerular and tubular lesions, considered them degenerative, and applied the term "lipoid nephrosis" to the entity.

Third, does every case presenting clinically the nephrotic syndrome exhibit the glomerular and tubular lesions of lipoid nephrosis? The important part of the question concerns the glomerular lesions. Are glomerular lesions found in every such case? The answer is no, not in all cases. Sometimes the glomeruli are anatomically normal. When glomerular lesions are found, are they always like those illustrated in today's case? Again the answer is no. There are cases that present the nephrotic syndrome in which the glomerular lesions are those of subacute, diffuse glomerulonephritis. These have been called cases of mixed type. Time does not permit further discussion of such cases.

Fourth, what is the evidence that there are cases of lipoid nephrosis in which the glomeruli are normal? The evidence is both pathological-anatomical and clinical. In adults, it seems, very few cases lack the glomerular lesions that we have seen in this child today. But according to Bell, in children younger than 12 the lesions are frequently absent or else thickening of the basement membranes is inconspicuous. Bell's work also indicates that when the childhood disease goes on for longer than a year, glomerular lesions such as you have seen today usually are found. The glomerular lesions in our case today are perhaps atypical findings because the disease had been present only two months and because the child was only five years old.

Fifth, what is the importance of this rather mild glomerular injury when it occurs? In our case today we see that some degree of azotemia and hypertension may develop in the acute stage of the disease. I think these physiological disturbances would have disappeared had the child lived somewhat longer. The real importance of these glomerular lesions is that they may slowly progress and eventually cause renal ischemia, permanent hypertension and azotemia. The anatomical progression can be traced from mere thickening of the basement membrane to glomerular hyalinization of extreme degree. When that happens, hypertension ensues. When hypertension comes along the afferent arterioles become sclerotic. When they become sclerotic the glomeruli are damaged further. As the glomeruli are damaged further, there is greater hypertension. It is a vicious circle that often requires years to be established.

Dr. Delp: As puzzling as this disease has been and as intriguing as it has been, and that is obvious from the comments Dr. Stoddard has already made, there have been some recent stimulating developments in regard to response to new therapy. Dr. Miller, do you wish to comment on the use of ACTH in these cases?

Dr. Miller: ACTH will get rid of the edema temporarily. Every once in awhile it will perhaps do so permanently. Within the first two months of the onset of this disease, 25 to 40 per cent of the children will have spontaneous remissions, so we carry out no treatment of any kind the first two months of the illness. This child did not get ACTH because she already had considerable renal insufficiency with an NPN which was persistently around 80. She was so edematous that I was afraid of making her more sick, simply because ACTH is associated frequently with retention of large amounts of water.

You do get a response with paracentesis. Again this can be only a temporary thing. Anything you do for these children is temporary. Whether they get well or not hinges on something within them, and what that factor is nobody seems to know.

I go along with what Dr. Stoddard has said about the pathology. I have one question which I would like to ask him. That is, can he tell any difference between the terminal kidney of an individual who has gone through a long process of so-called lipoid nephrosis and the terminal kidney of a person who started with acute hemorrhagic nephritis and survived a year or two and then died of renal insufficiency. Can you tell any difference in the microscopic studies of those two kidneys?

Dr. Stoddard: Well, yes, I think you can. There are similarities between the two, but there is one bit of help. The glomerular capillaries in the case of lipoid nephrosis remain patent for a long time, even years. It is a slowly progressive process that narrows these capillaries. But in the case of acute diffuse glomerulonephritis, many glomeruli are injured quickly and are hyalinized early. Also, as the

result of glomerular exudate, epithelial crescents form. In the case of lipoid nephrosis, the kidney may remain large although it is severely scarred, and hardly a functional glomerulus remains after 15 or 20 years. But in the case that began as acute, diffuse glomerulonephritis, the kidney is often quite small, 60 to 70 grams. These are sometimes helpful points. In either case, however, hypertension may develop. The results of hypertension are the same, no matter what the primary cause. They are progressive arteriosclerosis and glomerular scarring.

I am commenting about adults because I actually don't know about children. I am not familiar with good reports on the appearance of the kidneys 15 to 20 years after lipoid nephrosis in early childhood.

Dr. Andrew Mitchell (Urology): The only comment I would like to make on the whole problem is from the point of view of functional studies in a patient with nephrosis. Attempts to study it have produced functional studies as confusing as are the clinical and pathological aspects. This is one of the few diseases in which children will have super normal values for tubular function. Usually we consider a certain maximum tubular function as being 100 per cent of normal, and any changes from that will be a decrease. However, in children particularly, tubular function can change in a matter of two weeks from perhaps 200 per cent of normal down to 10 or 15 per cent of normal and back to 100 per cent of normal with no apparent clinical change to go along with it.

Some of the foremost renal physiologists in the country have said that average figures for renal function can mean absolutely nothing in this disease process and that function studies are of less value in studying this disease than any other renal disease.

Dr. Miller: The last few of these patients on whom we have used ACTH have shown an increase in NPN that is presumably transient. I talked with Dr. Barnett of Cornell a few weeks ago and he said that, in their experience, it was a temporary thing. In our whole experience, it hasn't been so temporary. That made me a little dubious also about treating this girl who consistently ran an NPN of 80.

Summary

The anatomical diagnoses were as follows:

Lipoid nephrosis—lipoidnephrose (Fahr), lipoid nephrosis of mixed type (Bell), Type 2 nephritis (Ellis, Evans and Wilson), chronic membranous and chronic lobular glomerulonephritis (Allen), tubular nephritis.

Generalized anasarca, including ascites and hydrothorax.

Bilateral pulmonary atelectasis.

Moderate cardiac dilatation.

Terminal petechial gastric hemorrhages.

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ACTIVITIES OF MEMBERS

Dr. E. J. Ryan, Emporia, spoke on "Endocrine Glands" before the Civic Improvement Club at Hartford recently.

* * *

Dr. R. E. White, Garnett, has been named coroner of Anderson County.

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A feature story about Dr. George M. Gray was carried in the *Kansas City Kansan* last month on the occasion of his 96th birthday. Dr. Gray retired from practice in 1943.

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Dr. H. O. Bullock, Independence, was speaker at a meeting of the Child Study Club in that city recently, discussing "New Developments in Preventive Medicine."

* * *

Dr. William Brownell has returned to Wichita after completing a postgraduate course in ophthalmology at the University of Texas and is now practicing in association with his father, Dr. Morton E. Brownell.

* * *

Dr. Philip W. Morgan, Emporia, has been named a member of the Committee on Education and Information of the American Heart Association.

* * *

Dr. William B. Scimeca, Sedan, began a four-year fellowship in surgery at the Mayo Clinic, Rochester, Minnesota, on April 1.

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Dr. Dale C. McCarty, Medicine Lodge, recently enrolled for postgraduate work at the Cook County Graduate School of Medicine, Chicago.

* * *

Dr. C. H. Benage, Pittsburg, was one of the speakers at the convention of the Kansas Pharmaceutical Association held in Topeka in March.

Dr. R. W. Lance, Moline, has been ordered to active duty with the Army medical corps.

* * *

Dr. Lottie F. Law, who has completed 50 years of medical service, was honored by Hill City on Sunday, March 30. About 2,000 people were present for the occasion. Feature stories on Dr. Law's career were carried in many papers including the *Knasas City Star, Hill City Times, Topeka Capital, Hays Daily News, Rooks County Record* and *Morland Monitor.*

* * *

Dr. C. S. Adams has been named health officer of Stafford County for the unexpired term of the late Dr. J. C. Ulrey.

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Dr. Mary T. Glassen, Phillipsburg, was speaker at a meeting sponsored by the Central School P.T.A. at Pratt on March 31.

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Dr. Thomas G. Orr, of the University of Kansas Medical Center, gave the 19th annual E. Starr Judd lecture at the University of Minnesota on March 20. His subject was "Some Observations on the Treatment of Carcinoma of the Pancreas."

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Dr. Homer S. Foutz, Minneapolis, was the subject of a feature story printed in the *Minneapolis Messenger* on March 20.

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Dr. Bernard A. Brungardt, Salina, now a major in the Army medical corps, received mention in a dispatch by Keyes Beech from the 51st Fighter Wing in Korea. The reporter quoted Dr. Brungardt, a flight surgeon, on treatment for paralysis sometimes suffered by jet pilots while flying at extremely high altitudes. Dr. Brungardt has tried reducing pilots' nitrogen intake by having them breathe nothing but pure oxygen for 10 to 15 minutes before take-off. Reports from pilots indicate that this has helped, but studies are continuing.

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Dr. W. K. Walker, Cedar Vale, has announced plans to spend mornings in Sedan in the office of Dr. William B. Scimeca, who is taking postgraduate work.

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Dr. Vernon M. Winkle, Kansas City, has been elected vice president of the Middle States Public Health Association, of which he is a charter member.

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Sunday, May 4, has been named "Dr. Haskins Day" in Kingman in honor of Dr. H. E. Haskins who has been practicing there for 50 years.

* * *

Dr. Donald W. Selzer, Manhattan, reported for active duty with the Army at Brooke Medical Center, Texas, on April 22. He had planned beginning a fellowship at the Mayo Foundation on April 1, and has been notified that he may accept the fellowship on the completion of his Army service.

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Dr. K. L. Lohmeyer, Emporia, spoke on "New Medicine and Methods of Treatment" at a recent meeting of the Lyon County Practical Nurses' Association.

* * *

Dr. Creighton A. Hardin and Dr. David W. Robinson, of the University of Kansas Medical Center, are authors of a paper, "The Surgical Treatment of Extensive Skin Cancer of the Lower Eyelid," published originally in this Journal and abstracted in the March issue of *Digest of Ophthalmology and Otolaryngology.*

* * *

Dr. James A. Wheeler, Newton, was speaker at a meeting of the Wichita Rotary Club.

* * *

Dr. Herbert L. Songer, Lincoln, announces that Dr. Harold Smith, formerly of Des Moines, is now associated with him in practice. Dr. Smith is a graduate of the University of Kansas School of Medicine.

* * *

Dr. A. W. Fegtly and Dr. C. W. Miller, Wichita, attended the annual meeting of the American Academy of General Practice in Atlantic City last month. Dr. Fegtly served as chairman of the Committee on Constitution and By-laws of the House of Delegates and Dr. Miller served on the Committee on Membership.

* * *

Dr. Galen M. Tice, head of the department of radiology at the University of Kansas School of Medicine, was guest of honor at a dinner given in Kansas City recently by all of the former residents who served under him and the four current residents.

* * *

Dr. Frederick H. Chard, Wichita, spoke on "Industrial Dermatitis" at a recent meeting of the Central States Conference of National Association Claimants' Compensation Attorneys. The meeting was held in Wichita.

The average person in the United States uses about six pounds of salt and 95 pounds of sugar each year as seasoning.

Only 42 cases of smallpox were reported to the Federal Security Agency in 1951.

DEATH NOTICES

JOHN CALVIN ULREY, M.D.

Dr. J. C. Ulrey, 75, who had practiced in St. John since 1920, died February 24 in Orlando, Florida, after a week's illness. He was an active member of the Stafford County Medical Society. Dr. Ulrey was graduated from Kansas Medical College, Topeka, in 1906 and began practice at Windom, later moving to St. John.

* * *

ALEXANDER C. CRAIG, M.D.

Dr. A. C. Craig, 69, an active member of the Shawnee County Society, died of a cerebral hemorrhage while en route to his office in Topeka on February 29. He was a graduate of Northwestern University Medical School, Chicago, with the class of 1907 and began practice in Denver, specializing in surgery and serving on the faculty of the University of Colorado School of Medicine. Dr. Craig moved to Topeka in 1934 and retired from active practice. He resumed practice in 1943 and continued active work until his death.

* * *

CHARLES NAPOLEON PETTY, M.D.

Dr. C. N. Petty, 83, Altamont, an honorary member of the Labette County Society, died at the home of his daughter in Bird City on March 16. Until he became ill, a month before his death, he had practiced continuously since his graduation from Kansas City Medical College in 1896. With the exception of a short period during World War I, when he served in the Army Medical Corps, he practiced only in Altamont.

* * *

PHILIP JOHNSON CLARK, M.D.

Dr. P. J. Clark, 36, an active member of the Central Kansas Society, who had been practicing in Hays, died March 23 at Kansas City. He had been ill with leukemia for about six weeks. He was graduated from the University of Chicago School of Medicine in 1940, and during the war served with the marines in the South Pacific. After a three-year surgical residency at the University of Kansas School of Medicine, he began practice in Hays, where he was associated with the Eddy Clinic.

* * *

SETH LEROY COX, M.D.

Dr. Seth Cox, 71, who lived in Topeka before his retirement in 1950, died in Seattle, February 26. A graduate of Jefferson Medical College, Philadelphia, in 1912, Dr. Cox was interested in diseases of the chest and came to Kansas in 1919 as medical director of the Kansas Tuberculosis Association, a position he held until 1928. He later went to Seattle to work with the Washington Tuberculosis Association, returning in 1943 to be executive secretary of the Kansas association. He was a member of the Shawnee County Medical Society.

* * *

EARL LEROY VERMILLION, M.D.

Dr. E. L. Vermillion, 56, an active member of the Saline County Medical Society and a past president of that group, died in Salina, April 7. He was a graduate of the University of Kansas School of Medicine in 1917, and began practice in Salina in 1919. He was the son of a physician, the late Dr. Clinton D. Vermillion, who practiced for many years in Tescott. Another member of the family in the medical profession, Dr. Dale D. Vermillion of Goodland, survives.

* * *

FRENCH MILES SMITH, M.D.

Dr. F. M. Smith, 73, a physician at Lyndon for 43 years, died April 19 at a Topeka Hospital. He was an active member of the Osage County Medical Society and was serving as secretary at the time of his death. He was graduated from the University Medical College of Kansas City in 1909, and immediately afterward began practice in Lyndon, specializing in eye, ear, nose and throat work.

* * *

JOHN BENJAMIN NANNINGA, M.D.

Dr. J. B. Nanninga, 53, who had been on the staff of the Bethel Deaconess Hospital and Clinic at Newton for 12 years, died of a heart attack on April 18. He was graduated from Rush Medical College in 1928, and after his internship in Chicago went to Germany for a year's postgraduate work in pathology at the University of Hamburg. For several years after his return to this country he was associated with the department of research at the University of Kansas School of Medicine, then going to Goessel to Bethesda Hospital. He began work on the staff at Newton in 1940, and at the time of his death was serving as director of the clinic.

Senior Thesis from the University of Kansas Medical School*

Pleural Effusion**

Vale Page, M.D.
Temple, Texas

Certain Aspects of Pathological Physiology

I. *Pleural Effusion*

A. Pathogenesis, Etiology, Anatomical and Physiological Factors.

Historically this is a subject with which Hippocrates and Galen were acquainted, and a subject about which many words have been written. Here I wish to consider first physiology and pathogenesis of the various causes of pleural effusion.

Barnwell[3] states that "in a loose sense the term 'pleural effusion' is used to denote any collection of fluid in the pleural cavity, regardless of origin." More restrictedly he limits the term to inflammatory nonpurulent exudates appearing in the pleural cavity. Throughout this paper I have more or less held to the former designation, unless otherwise specified. Also for purposes of definition and clarification I should like to offer Boyd's[4] conception of transudate as opposed to exudate. He writes that a fluid transudate has a specific gravity below 1.018, and a protein content below four per cent. From author to author there seems to be a slight variation from these figures, but none were far removed.

There are various and sundry explanations for the different phenomena occurring in pleural effusions. It is well to emphasize initially several simple facts. Normally the thoracic cage and viscera physiologically compensate to an insult usually in the following order: 1. Lungs—collapse or overexpand; 2. Mediastinum—shifts or becomes fixed; 3. Diaphragm—elevates, drops, or becomes immobile; 4. Thoracic cage—becomes fixed as by muscle splinting.[1] Pressure relationships of the above mentioned viscera to mechanisms of respiration and circulation are of uppermost importance in any discussion of thoracic physiology. According to Sodeman,[2] approximate intrapleural pressures (on quiet recumbent breathing) are —7 cm. water on inspiration to —2 cm. water on expiration. This negative pressure is an important factor in the filling of the vena cava, pulmonary veins, and cardiac auricles. It is not illogical then to reason that with increased intrapleural pressure (toward the positive side) there comes about an increased systemic venous pressure, thereby resulting in passive congestion.

In the normal lung there is a small amount of fluid "lubricating" the pleural surfaces; this balance is kept by a constant flow mainly from the visceral pleura, and such fluid is reabsorbed by the parietal pleura and is thus drained systemically.[1] This does not go so far as to say that the reverse cannot be true. For it is well known that encapsulated intralobar effusions must be drained by the visceral pleura since there is no parietal pleural connection in this situation.

Before considering specific etiological agents there are, first, some interesting physiological factors which influence the intrapleural pressures, and secondly, a number of anatomical and physiological interrelationships in the mechanism of pleural effusion.

In atelectasis resulting from a total bronchial obstruction, inspiration produces a highly negative pressure. The latter may cause elevation of the diaphragm or shift of the mediastinum. Bronchial asthma represents a partial obstruction in both inspiration and expiration; a very wide swing of pressure is observed here because of the inability of the lung to follow quickly the thoracic respiratory movement. Emphysema denotes a lessened elasticity of the lung tissue resulting in intrapleural pressures hovering close to atmospheric pressure. The presence of air or fluid in the pleural cavity lessens the negative intrapleural pressure, and displacement may result according to the amount of air or fluid concerned.[1]

Aside from these above mentioned factors affecting intrapleural pressures, there remain numerous facets also to be considered such as lymph drainage of the lungs, common factors conducive to pulmonary edema, the role of vasomotor control, and others beyond the scope of this paper.

This is not to propose a rigid classification of the causes of pleural effusion, yet it is an attempt to produce a workable outline whereby the common etiologies can be considered concomitantly with ensuing desideratum. Experiments have suggested that some abnormality of the pleura must exist before effusion occurs. Some of those abnormalities involve impaired absorption from the following: inflammation with thickened pleura; edema of the pleura; fibrosis following inflammation; obstruction due to neoplasms; passive congestion; and pneumothorax which in an unknown manner reduces ab-

*This is one of 11 senior theses selected for publication by the Editorial Board from a group of 15 judged the best by the faculty of the University of Kansas School of Medicine.

**Thesis written while the author was a senior student at the University of Kansas School of Medicine. Dr. Page is now serving his internship at the Scott-White Clinic, Temple, Texas.

sorption of fluid by 25 to 50 per cent. The following is outlined by Myers and McKinley[1] with a few additions:

I. Pleurisy with effusion: A. Tuberculosis; B. Primary or metastatic carcinoma of the lung; C. Rheumatic pleurisy; D. Brucella; E. B. tularense; F. Colon-thyroid group; G. Actinomycosis; H. Amebiasis.

II. Sterile inflammation of the pleura: A. Pneumococcus (including lung abscess); B. Atypical pneumonia; C. Sympathetic; D. Pulmonary infarction; E. Traumatic-subpleural hematoma; F. Post-irradiation pleurisy with effusion; G. Neoplasms.

III. Non-inflammatory pleural fluids: A. Congestive heart failure; B. Constrictive pericarditis; C. Superior vena cava obstruction; D. Cirrhosis of the liver; E. Renal disease; F. Nutritional deficiencies; G. Anemia.

Only a selected few of these items will be discussed in the following paragraphs. Moreover hemothorax, usually of traumatic origin, and chylothorax, which can be caused by trauma or neoplasms (Hodgkin's), are two facets of pleural fluid study which are not included in this paper. As previously stated, tuberculosis will be related in chapter II, since it is considered the most common cause of pleural effusion up to the age of 40. Beyond 40 neoplastic causes are most common.

In a series of 41 cases Timer and Olsen found pleural effusion associated with primary neoplasms in the following order: 1. Intrathoracic; 2. Neoplasms of the breast; 3. Tumors of the ovary. Avenues of neoplastic spread to and within the lungs include blood, peripheral lymphatics, and via the diaphragmatic lymphatics. Laurie[7] relates that malignant states within the chest are most often associated with hydrothorax because of a lymphatic or venous obstruction. By various pathological mechanisms these growths may result in a pleural effusion. First, a pathological tumor nodule grows under the pleura, causes an irritation in the overlying pleura and hence an effusion comes about. In fact nearly all pleural effusions caused by neoplastic processes develop because of the inflammatory reaction initiated as new growths invade the pleura.

Sometimes a mediastinal neoplasm will be so invasive as to obstruct the pulmonary lymphatics and occasionally the veins without an actual pleural involvement (Hodgkin's disease, or a lymph borne carcinoma). The backed up lymph in overloaded dilated channels leaks through the visceral pleura. Also in a superior vena cava or vena azygos obstruction the same principle of back-pressure is involved but disrupts the normal absorptive processes through the parietal pleura. A true exudative pleurisy may occur in primary mesothelioma,[7] but such instances are considered rare. Furthermore, effusion may come about via vegetative and thrombotic emboli, from malignant cells metastasizing to both subpleural tissues, and by cortical zone involvement of the lung with dissemination peripherally.

The so-called "sympathetic" effusion results from the anatomical fact that the capillaries of the pleura and peritoneal surfaces of the diaphragm intercommunicate. In addition, when chronic adhesions grow between the parietal and visceral pleura, concomitant lymphatics grow across and connect the lymphatics of these pleurae and the diaphragm or pericardium. Such a statement is indicated by the unusual sites to which the lymph of the lung is drained. The latter is verified by the accumulation of carbon picked up from the pulmonary alveoli and found in such nodes as the axillary intercostal, internal mammary, or superior gastric.[8]

There is an intriguing entity called Meigs's syndrome[9] which is a pleural effusion resulting from an ovarian fibroma. According to Anderson,[10] this is a so-called edematous fibroma usually associated with ascites and hydrothorax. The latter is explained by a transudation from the tumor itself with transmission through the diaphragmatic lymph channels, artificial blockage of which was shown to prevent the development of hydrothorax.

It should be emphasized that malignant growths are the most common cause of sanguinous exudates. Effusions caused by malignancy are also characterized by rapid accumulation, and by the fact that they are usually exudates. Pleural effusion arising in a patient with brain tumor should suggest to the clinician that bronchogenic carcinoma is responsible for both pleural and cerebral metastases. As would be expected the most difficult differential diagnosis is with tuberculous effusion.

Effusion accompanying rheumatic fever does not seem to be common. The latter is regarded as a systemic disease, and among other tissues it attacks serous membranes selectively, e.g., synovial membranes, endocardium, pericardium, and occasionally the pleura. It is proposed that the infection spreads apparently by direct extension or via the lymphatics.[1]

A serious problem arises in any patient with pleural effusion because of indecision accompanied with incomplete knowledge of harm or good effected by tapping the pleural cavity. Almost assuredly one must withdraw fluid for diagnosis if all other means fail, and in cases where the patient is dyspneic or his life may be at stake. When empyema occurs secondarily to a streptococcus lung infection, the effusion is immediate and occurs usually at the height of the parenchymal involvement. At this par-

ticular time the vital capacity is most greatly reduced. A tap may be needed to increase the vital capacity, yet there is danger of mediastinal shift or perhaps collapse of a lung. Open drainage at this time would be dangerous because the lung may not be adherent to the chest wall and fixation of the mediastinum may not have taken place. Probably aspiration is indicated for relief of the patient.

On the other hand, an empyema developing from a pneumococcal infection develops late in the course of the parenchymal involvement when the vital capacity is practically normal. Actually an empyema may represent a late manifestation of effusion whereby pus collects in the intrapleural space.

A choice of three methods of draining—aspiration, closed drainage, and open drainage—is based on the following factors: 1. Duration of the pleural infection; 2. Consistency of the pus; 3. Vital capacity of the patient. In most instances resection of a part of a rib with open drainage is recognized as the most satisfactory method. The problem of aspiration in tuberculous effusion will be discussed later.[11]

Before concluding the remaining points on physiology of effusion, a few remarks will be made concerning the chest pain related to pleurisy with effusion. Boyd[4] believes that the principal factor in the production of chest pain from pleurisy is tension which, in turn, is caused by stretching of the sensitive inflamed parietal pleura during breathing. Hence, the reason for strapping a chest to prevent pain is to limit movement and not to prevent friction. He states unequivocally that chest pain is not caused by friction of the inflamed and roughened surfaces, for the friction rub may still be audible after pain has discontinued, and that pleural pain may come on even after a pneumothorax. Contrary to this belief, Myers and McKinley[1] consider friction the most important element and credit tension to causing a still lesser degree of pain.

Pleural effusion is regarded by Soresi[12] as the most valuable natural process of defense. He writes, "We can therefore logically assert as an incontrovertible fact, that the accumulation of fluid in the pleural cavity puts the parietal and visceral pleura at rest." According to Barnwell,[3] the lungs float in the pleural fluid which lies in the bottom of the pleural cavity. The development of an effusion allows collapsing of a portion of the lung tissue, but not necessarily commensurate with the same volume of fluid. By compensatory means, intrapleural pressure is increased but remains below that of atmospheric pressure until the pleural cavity is approximately half filled with fluid. It is at this stage in particular that Soresi believes the effusion to be a protective mechanism and that it should not be removed except to relieve dyspnea.

What is the initial reaction of the pleura to infection, and how does the accumulation of fluid take place? This is a broad question. One should realize there is first a formation of thin watery effusion. The total pleural area may be involved, but because of the ability of the pleura to localize, as well as gravitational influences, fluid accumulates posteriorly and at the base of the lung.[11] As the fluid collects here it is pushed up by the pneumatic pressure of the lung into the shape of a cone. The more common radiological aspects will be dealt with in the next section.

Clendening and Hashinger[13] emphasize that the triad of signs—dullness, absence of fremitus, and absence of breath sounds—is found only in the back. They believe that the sign of "the fluid moving on change of position of the patient" must be discarded since air must also be present to make the sign a trustworthy one. Interestingly enough, Grocco's triangle is tagged "completely passe" as a diagnostic sign by the latter authors who claim that the sign is present only in massive effusion or in effusions along the vertebral border. Moreover, Skodiac resonance is said by the same writers to be the easiest of the accessory signs to demonstrate, but adds little to the diagnostic armamentarium and "should be forgotten."

B. Roentgenological Considerations.

Friedrich Müller was very much aware of the x-ray-physical diagnosis interrelationships when he wrote the following paragraph quoted from Dr. Major's text:[14] "Many physicians have the idea that the art of percussion and auscultation are antiquated because they have been replaced by examination with the roentgen rays and the tuberculin test. They are, however, more necessary today than they were a hundred years ago, and they have not been superseded by the roentgen rays, for percussion and auscultation are now more necessary than ever, in order to interpret properly our x-ray pictures.

"The art of percussion and auscultation has gained greatly in accuracy, since the findings can be controlled by the roentgen pictures. Formerly the correctness or the errors of percussion could be demonstrated only by autopsy. Today we can study the accuracy of our results in percussion on the living man and under natural conditions. It is also a great blessing that the roentgen plates have shown up the errors of an over-refined technique of percussion and auscultation."

In bold contrast to the foregoing, Custer and Evans[15] write that physical signs are relatively unimportant compared to modern roentgenography. Because of the frequently seen complication of effusion following artificial pneumothorax, one may

fall into the error of assuming that fluid in a chest always appears on the film as a dense and sharply demarcated opacity and in the dependent part of the chest. This is by no means always true, for air often is not present above the fluid and no sharply horizontal outline can necessarily be made out.

Rothstein, Emil, and Landis[16] write that the most common configuration for effusion to assume is curvilinear with the concavity downward and outward extending up along the axillary border of the chest. These same writers emphasize that such a localization of fluid may be confirmed on physical examination as the "curved line" of Damoiseau and the "S" line of Ellis. Clendening and Hashinger discard the latter finding as a physical diagnosis sign.

According to Katz,[17] less than 400 cc. of fluid cannot be demonstrated by physical examination or ordinary posterior-anterior chest film. Particularly in these instances is a lateral film of the chest required to recognize fluid in the lower posterior aspect of the pleural cavity. It should be further emphasized that in searching for fluid, fluoroscopic and roentgenographic examinations in a variety of positions are mandatory for proper evaluation, especially with reference to the frequent atypical conformation of chest fluid. A common type of such atypical pleural effusion is that which accumulates in the paramediastinal pleural space. In this particular study all of the paramediastinal effusions were tuberculous in origin. A mediastinal pleurisy secondary to pneumonia is found in one to two per cent of routine chest films in children under one year of age. These same shadows may be mistaken roentgenologically for atypically appearing thymus gland shadows.[18]

Periapical effusions are rare, occur mainly in children, and are almost invariably empyemas.[18]

A sudden appearance of an unexplained elevated leaf of the diaphragm plus an additional less conspicuous finding of minimal blunting of the costophrenic angle is suggestive of an infrapulmonary effusion. When these opacities are examined with the fluoroscope, the effusion usually moves synchronously with the diaphragm. Pneumoperitoneum may be used as a diagnostic technique here as well as in kidney or liver neoplasms. Oral citrocarbonate may be used advantageously to demonstrate the left diaphragmatic level. With the effervescence and filling of the stomach with gas, a clearer delineation between fluid level and diaphragmatic level may be possible. The subject of hemothorax is not detailed here, but like serous effusion lends itself to x-ray diagnostic techniques, and for the sake of completeness it cannot go entirely unmentioned. Blood in the pleural space does clot, but it has been hypothesized that apparently the blood usually remains fluid due to the defibrinizing action of respiratory movement. Malignant neoplasms account for 65-85 per cent of hemorrhagic pleural effusions. A second most common cause has been found to be pulmonary infarction. The more rare causes of hemorrhagic pleurisy are pneumonia, cirrhosis of the liver, leukemia, and spontaneous pneumothorax.[18]

II. *Tuberculosis and Pleural Effusion*

A. Adult Manifestations

Within the past few months a treatise has been written by Falk[19] whose purpose in writing was to emphasize the importance of pleural effusion as a clinical manifestation of active tuberculosis. Sibley[20] pleads further that even small effusions, regardless of how slight, are potentially as dangerous as the most massive effusions. Most commonly the peak of incidence is age 20, with a general range of 15 to 35.

The mechanism of tuberculous pleural effusion is considered by most writers to be a reaction subsequent to the development of tuberculin sensitivity during and following a primary tuberculous infection. That a sensitized pleura is necessary for development of effusion has been proved by Patterson,[22] Lemon,[23] and others. According to Laurie,[7] Falk,[19] and others a primary subpleural nidus occurs which results in the primary complex and sensitizes the individual to tuberculin. From this primary focus it is assumed that there is an extension of tubercle bacilli to the pleura, or the caseation and discharge of a subpleural focus into the pleural sac. Thompson[21] relates that fluid tends to occur on the same side as the pulmonary lesion. The latter occurred more often on the right side as attested by all observers from the time of Ghon onward. Of course other sources of infection may be the lung parenchyma, hilar nodes, or more rarely erosion of a dorsal spine.

When contralateral effusions occur, they may be explained by extension across the mediastinal lymph channels and by the fact that the most distal of the affected nodes is often the most heavily infected. A hematogenous dissemination is to be considered in bilateral pleural effusion, which sometimes is the first evidence of a fast moving generalized miliary tuberculosis. Laurie adds that extrathoracic tuberculosis complications due to hemic spread are almost seven times as common in bilateral effusions as in unilateral effusions. In some cases of miliary tuberculosis, spread may so overwhelm the body that no effusion results.[24] Scherf and Boyd relate that bilateral hydrothorax is an early and regular occurrence in acute hemorrhagic nephritis and signifies general capillary damage.[32]

There is the question as to why effusions do not

occur more often in chronic tuberculosis. The state of allergy is enhanced in the tuberculous patient near the time of the primary infection. This may account for the frequency of massive and sometimes polyserous exudative reactions. In contrast, with the passage of time decreasing the allergic intensity and the tendency toward formation of adhesions, the occurrence of serous effusions in chronic pulmonary tuberculosis is uncommon.

The first great exponent of tapping the pleural cavity was a Frenchman by the name of Trousseau who, in the latter part of the 19th century, led the French school into first realizing the frequent relationship between a collection of clear fluid in the pleural cavity and early tuberculosis.[24] Falk states that laboratory studies of aspirated chest fluid are not reliable criteria for diagnosis when only 20 to 30 cc. of fluid are taken. He pleads for removing at least 500 cc. of fluid for bacterial study for which he claims a much higher percentage of positive results. In explaining the negative pleural fluid finding in certain cases, he suggests the possibility of a filterable atypical tubercle bacillus, antigen-antibody reaction, or a paucity of bacilli.

Some interesting work on the relationship of pleural fluid sugar to pulmonary tuberculosis was done by Gelenger and Wiggers.[25] However, such correlations were previously noted by Pinner[26] and Gruner.[27] The former authors in their studies considered 30 mg. per cent pleural sugar content as diagnostic of tuberculosis; 30 to 60 mg. per cent was thought presumptive, and above 60 mg. per cent was said to be non-tuberculous. This was a small series, however, and this hypothesis still remains to be substantiated. As a further aid in diagnosis, a history of repeated aspirations of large amounts of fluid is less apt to mean tuberculosis than Hodgkin's disease or chylothorax. A rapidity in progression from a clear fluid to pus may be helpful in diagnosis. In pneumonia such a change is a matter of days, in tuberculosis weeks and months, and in actinomycotic fluid somewhere between pneumonia and tuberculosis.

It is estimated that 15 per cent of tuberculosis patients have had a previous pleurisy with effusion. In the United States the incidence of tuberculosis following pleurisy with effusion is about 25 to 35 per cent.[19, 28] Schuman's study of 214 patients showed tuberculosis more common in the male than in the female and that effusions occurred (two to one) more frequently in males.[29] In Maclean's studies[24] he states that the most important single factor in the possible development of tuberculosis is the duration of pleural fluid. Other less important criteria are size of effusion, duration of fever, and age of the patient.

B. Effusions in Childhood

The mechanisms described are apparently different from those in childhood where pleural effusion with primary infection is infrequent. Maclean[24] submits that the essential factor may be the larger initial dose of infection which adults tend to receive, so that the primary focus sustains a longer activity and allows hypersensitivity to develop while the pleura is invaded by tubercle bacilli resulting in effusion. In addition, he postulates that adults will be infected with larger droplets which can penetrate to the larger terminal adult bronchioles, and that the ciliated bronchial epithelium is more efficient in children. In a study of 393 children under the age of two with tuberculosis, Hardy and Kendig[30] found an incidence of 313 per cent of pleurisy with effusions, which indicates that it is not a rarity. Smithers[31] summarizes the important aspects in childhood effusions as follows:

1. The immediate prognosis in children having sterile effusions is very good (the more remote prognosis is not so satisfactory).

2. Tuberculosis is a much less frequent sequela of pleural effusions in children than in adults, but occurs sufficiently often to necessitate prolonged treatment and careful supervision.

3. The dangerous period to the child is the first four years following the effusion and particularly the first year.

4. The most common sequelae in children appear to be pulmonary tuberculosis and spinal caries.

III. *Heart Failure and Right-sided Hydrothorax*

There are many theories and attempts at explanation for the preponderance of right-sided hydrothorax with heart failure, but few if any incontrovertible instances of proof of such theories have been offered. At best one can only review the numerous factors which various authors have claimed play a role in the production of selective hydrothorax.

McPeak and Levine[33] have written the most complete analysis of this subject, and what follows is a reproduction of their studies plus additions from a few other writers.

In 1930 there was produced some experimental evidence contending that a greater relative degree of negative pressure existed in the right pleural space as compared to the left. Such a state of affairs was upheld by other theories on the basis of the anatomical relations between the thoracic aorta and the hemiazygous vein with its valves. In studying pulmonary edema, Weiss[34] concluded that edema began usually in the right lung[36] and remained more

intense on this side. Perhaps the presence of more pleural surface on the right may have some bearing upon the increased congestion here. Bedford[35] found left hydrothorax in 18 of 38 cases with left heart failure, and right hydrothorax alone in 9 of the 38 cases. This matter of left-sided predominance will be discussed later.

Pathogenesis of hydrothorax resolves about the anatomical fact that the pleural sacs have both a pulmonary and a systemic venous drainage. Therefore, both drainage systems must be considered in engorgement and production of hydrothorax. In right heart failure where one finds a severe venous engorgement of the systemic circulation, expected hydrothorax frequently does not occur. Even in tricuspid disease with failure, ascites is an early finding and hydrothorax occurs late. So the reverse of the expected occurs, and the marked clarity of the lung fields is borne out roentgenographically. It has been concluded that the essential factor in production of hydrothorax is pulmonary engorgement, and that with efficient drainage of the lungs by the left heart a heightened systemic venous pressure does not in itself cause pleural transudation.[37] Added factors may include the effect of a swollen liver which might interfere with diaphragmatic movement resulting in impairment of lung circulation in the right base.[36]

Bedford and Lovibond also sound a warning note that clinical observation has tended to over-emphasize the preponderance of right hydrothorax, perhaps by confusing it with liver dullness. Left hydrothorax predominates in hypertention and aortic disease with normal rhythm, although with fibrillation right-sided hydrothorax is most frequent. The same situation is seen in rheumatic heart disease with and without fibrillation.[36] Scherf extends the discussion to state that hydrothorax is bilateral or right-sided except under certain specified conditions, such as obliterative pleurisy on the right, left pulmonary infarction, or pericardial effusion, when a left unilateral effusion may occur.

The following factors which may tend to localize an effusion in heart failure are gleaned from various sources for the reader to peruse and weigh their validity in his own thinking:

1. The visceral pleura is the principal source of exudation.[37]

2. Peculiar environment of lungs and pleura plus increased susceptibility of capillaries to anoxia.[5]

3. Right lung is 10 per cent greater in volume than the left.

4. Extra lobe on the right, larger extent of circulation on the right, and increased pleural surfaces on the right.[38]

5. Diseases of lung or pleura.[33]

6. Pleural adhesions.[8, 33]

7. Impaired elasticity of the lungs and impaired respiratory movement.[5]

8. Enlarged auricles obstructing filling of heart on right side, and cardiac enlargement resulting in direct compression of lung tissue.[33]

9. High incidence of right hydrothorax with presence of auricular fibrillation.[36]

10. Inefficient lymphatic drainage of lungs through right lymphatic duct.[5, 41]

11. Left lung may receive greater relief from collateral circulation.[33]

12. Thrombosis of blood vessel. Obliteration of pleural space.[32]

13. Absorptive activities of visceral pleura as evidenced by resolution of localized interlobar pleural effusion.[1]

14. The weight of the heart produces a higher negative pressure in the uppermost side when the patient lies on his side.[3]

15. Higher venous pressures in right lung because of increased distance blood must be lifted to reach the heart, especially in cardiacs who favor the right lateral decubitus position.[39]

In summary it appears that in all heart disease, right hydrothorax predominates over left hydrothorax. Auricular fibrillation and rheumatic heart disease increase the liklihood of right hydrothorax, while left heart failure augments the chances for a left-sided hydrothorax.

IV. *Miscellany*

A. Treatment

In this section I wish to include those points of interest of more recent origin which would not have added materially under the topics already discussed.

Through the evolution of various treatments, some interesting reflexes were discovered experimentally and during penetration of the human pleura with a pneumothorax needle. Best and Taylor[40] describe an entity called "pleural shock" consisting of a marked slowing of pulse, profound fall in blood pressure, and a possible fatal syncope following puncture of the chest wall. This is an important consideration because it may be confused with air embolism. Experimentally Capps and Lewis[41] produced in dogs a similar cardio-inhibitory and vasomotor reflex by irritation of the visceral pleura. They suggest the advisability of replacing fluid with slightly less air to prevent such reflex manifestations.

Whereas thoracotomy has superseded most other methods of treating an infected effusion, some re-

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1. Kissin, M., Stein, J. J., and Adelman, R. J.: Angiology 2:217 (June) 1951.
2. Rickles, J. A. J. Florida M.A. 38:263 (Oct.) 1951.

*Contains at least 80% of anhydrous theophylline.

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cent experience[42] has shown good results with penicillin injected into the affected pleural space followed by frequent aspirations.

Tillet[43] has done some interesting work with enzymes, streptokinase and streptodornase, which resolve fibrin and permit more complete aspiration and thus shorten recovery time. With intrapleural injection of these enzymes, there is some difficulty, however, with pyogenic toxic reaction and the developing of specific antibodies. Some English investigators have used streptokinase and streptomycin intrathecally for tuberculous meningitis with a presumably lowered mortality.

B. Unusual Pleural Effusions

A pleural fluid eosinophilia has been discussed by MacMurray,[44] who states that such an entity exists when over five per cent of the cells in an effusion are eosinophils. The blood eosinophil count averages from four to seven cells in his three cases. The phenomenon may follow lobar pneumonia, may accompany Löeffler's syndrome, asthma, and pulmonary tuberculosis, and may represent a rebound phenomenon after adrenocortical stress.

Cholesterol pleural effusion is termed a rare type of pleural effusion with only 60 cases being reported in the literature. The authors[45] believe that tuberculosis is the most likely cause for cholesterol effusions. Cholesterol is practically always present in pleural fluid but when the complex balance with protein elements is upset, crystals of cholesterol are precipitated. Conditions necessary for precipitation of cholesterol crystals are:

1. Persistent exudate containing cholesterol from the blood.

2. Pleura must be thickened.

Other theories on etiology are pleural lipoidal degeneration, destruction of leucocytes in the pleural space, destruction of tubercle bacilli, and a general metabolic disturbance.

C. Ascites Formation with Cirrhosis

While ascites is not a part of this paper, the mechanism of its production is conducive to newer beliefs concerning the importance of such points as anoxia as exemplified and accentuated by Drinker.[5] Obstruction of the hepatic veins or vena cava results in ascites, but portal occlusion results in the development of collateral circulation and enlargement of the spleen. The writers[46] relate that portal hypertension and hypoalbuminemia do not of themselves produce ascites, but perhaps lend to the tendency to ascites if both occur together. These authors[46] found also that the kidneys did not excrete sodium in proportion to sodium intake and that there was a concomitant decreased water output. It was proposed, after finding unusual amounts of antidiuretic substances in ascitic patients' urine, that a greater tubular reabsorption of water was caused by an increased posterior pituitary antidiuretic hormone.

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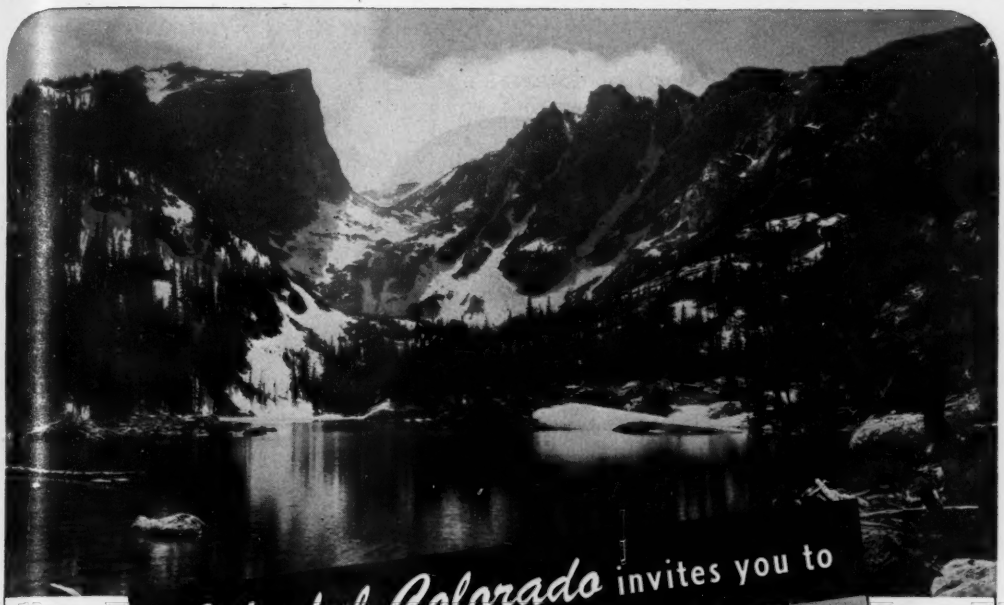

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BOOK REVIEWS

Signs and Symptoms. Applied Pathologic Physiology and Clinical Interpretation. Edited by Cyril M. MacBryde. Published by J. B. Lippincott Company, Philadelphia. 783 pages. Price $10.

The editor and a group of outstanding authorities collaborating with him in this second edition have improved a book which was remarkedly fine in its first appearance.

In words of the editor in his preface to the second edition, "A profound knowledge of all of Medicine's accessory sciences is of little avail without accurate diagnosis. 'Diagnosis' in the original Greek means knowledge through signs and that is what it should still mean. The physician's basic duty is to determine whenever possible the cause of the illness. Only when the mechanisms of disease are understood and insight has been gained into the manner of production of signs and symptoms can one proceed with the physician's ultimate duty of the relief of suffering and the amelioration or cure of disease."

This textbook should have particular appeal to the clinician and to the practicing physician, but at the same time it should be invaluable to the student, intern, and resident.

Thirty of the common signs or symptoms commonly encountered in the practice of medicine are treated first in a manner to reacquaint anyone with the classical aspects of these features, and secondly a direct and quite adequate tie-in is made with the disturbed physiology associated with these signs and symptoms.

The first chapter in the book deals with the approach to an analysis and interpretation of symptoms, the history, etc. The second chapter deals with undoubtedly the most common presenting symptom in medicine—that of pain. This is discussed in detail as to the aspects of pain, the anatomy and physiology of pain, the psychology of pain, the clinical manifestations and function of pain. From this point some of the principal focalizations of pain are discussed in great detail. Other interesting and commonly encountered signs and symptoms such as palpation and tachycardia, cough, hemoptysis, dyspnea, jaundice, fever, fainting, pigmentation of the skin, and itching are likewise presented in a manner not encountered in any other textbook.

The adequate and complete bibliographies appearing at the end of each chapter testify to the thoroughness with which the various contributors entered into the development of each section.

The objectives of the authors to assist the physician in evaluating signs and symptoms of disease seem to have been well fulfilled in this book.—*M.H.D.*

* * *

Textbook of Refraction. By Edwin Forbes Tait. Published by W. B. Saunders Company, Philadelphia. 418 pages, 93 figures. Price $8.00.

This is an excellent textbook on refraction in which all aspects are adequately discussed. It is written in a manner that is easily read and is valuable for anyone interested in this phase of medicine. It is definitely a book designed for the specialist or one studying refractions and not for the physician in general practice.—*A.N.L., Jr.*

* * *

Textbook of Clinical Neurology. Seventh Edition. By Israel S. Wechsler. Published by W. B. Saunders Company, Philadelphia. 801 pages, 179 illustrations.

This is the seventh edition of a standard American text. In this edition the author has carried out a thorough revision of the previous volumes and has effectively modernized several sections, particularly "Treatment of Infections of the Central Nervous System," as well as including more recent material on cerebral-vascular anomalies and injuries to the brain and spinal cord. The revision of the chapter on neuroses is a useful guide for the neurologist and general practitioner. The references have been modernized.

The reviewer considers this textbook to be one of the most useful presently available in the field of clinical neurology. The index and arrangement of the book are good and the various sections are easy to read. It is particularly suitable for those interested in clinical neurology, especially those in general practice and students.—*C.E.B.*

* * *

The Clinical Use of Fluid and Electrolyte. By John H. Bland. Published by W. B. Saunders Company, Philadelphia. 259 pages, 75 figures. Price $6.50.

This very practical and readable textbook on fluid and electrolyte balance should prove exceedingly valuable to all clinicians. Besides discussing the general considerations of body fluids and electrolyte balance, this monograph also discusses the changes in fluid and electrolyte balance in the various disease states. This book is a must for clinicians and students who wish to approach the fluid and electrolyte problems intelligently.—*W.L.V.*

* * *

Diagnostic Bacteriology. Fourth Edition. By I. G. Schaub and M. K. Foley. Published by C. V. Mosby Company, St. Louis. 356 pages, 47 tables. Price $4.50.

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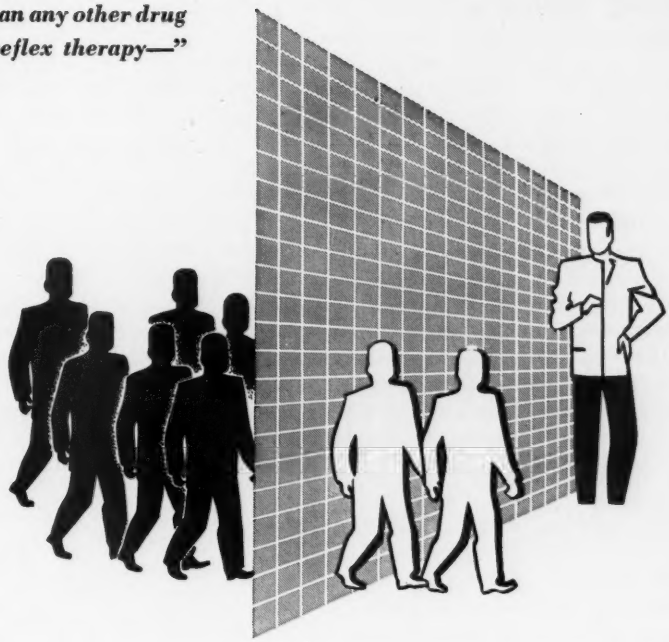

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Diagnostic Bacteriology is one of the rare texts on actual clinical laboratory procedures. Beginning with receipt in the laboratory of various clinical and autopsy materials, step-by-step methods are presented for isolating and identifying bacteria and fungi likely encountered. The authors are particularly to be commended for mentioning many practical details and "tricks" too often overlooked in more formal dissertations, and for including numerous recently developed techniques.

New in the fourth edition are an entire section on antibiotic sensitivity testing and expanded discussion of the selection and preparation of media. Procedures dealing with the tubercle bacillus and fungi are less well covered than most. The chapters on the biochemical identification of streptococci, enteric organisms, etc., have been extensively revised and this is an outstanding section in a generally fine book.—*H.C.R.*

* * *

Backache, Birth and Figure Relief by Self-Revolving Hipbones. By William Schoenau. Published by William Schoenau, Los Angeles. 264 pages, 42 illustrations. Price $2.00.

For many years there has been controversy as to the existence of changes in the sacroiliac articulations following trivial injury or other stresses and to the symptoms that are produced if such articulations are deranged. The fairly unanimous attitude of the medical profession has been that these changes and their consequences do not exist and the subject has been very largely ignored by the profession as a whole. Those outside the medical profession have aggressively forwarded the concept of disarticulations, subluxations and other abnormal relationships of articulations of the sacroiliac joints as not only existing but as being prominent causes of many disorders totally unrelated to one another. This book appears to be an expression of the latter concept.

The author self-admittedly is not a physician. He has based the theme of this book on the concept that it is possible, either deliberately or accidentally, to revolve the ilium on the sacrum forward or backward in a saggital plane or clockwise or counterclockwise in a frontal plane. This is the procedure which he terms self-revolving hipbones. It is his belief that such rotatory movements may occur with either ilium quite independently of the other, thus permitting combinations of several possible relationships of the two ilia to each other and to the sacrum.

The statements made stem from observations made by the author on himself, from "revolving the hipbones of a human skeleton, by dissecting the bones of animals and by measuring the pictures and printed x-rays of deformed people." He carefully omits any admission of having treated patients but broadly implies that the method should be used in various conditions.

The book is divided into five parts: care of the back, pelvis and figure; birth eased by self-revolving hipbones; diagnosis and mechanical operation; straightening one's figure daily; and how to self-revolve the hipbones. In each of these sections the importance of the normal relationships at the sacroiliac articulations is stressed together with deviations from the normal and the means to restore abnormal rotations.

That the author is sincere in his beliefs, the reviewer does not doubt. His information appears to be strictly self-derived, a circumstance which makes it difficult for him to discuss anatomical terms and relationships in any way other than that which sounds pseudoscientific. "The side edge of a hipbone may be moved 3/16 of an inch in front of the front of the top of an ala on a 1¼ inch radius for each 10 degrees its hip joint is revolved backward" (page 187) is an example of the confusion that exists throughout the book as the author attempts to explain his theories. It is unfortunate that he did not seek competent assistance in writing the book. The germ of truth which may exist is completely lost to the reviewer in the welter of over-repetition of the phrase, revolving hipbones, in the confusion of terms meaningless from the anatomical standpoint, and in the over-precise use of mathematical relationships which almost certainly do not exist.

It is doubted that this book contains much of interest to the average physician.—*D.L.R.*

* * *

Dynamic Psychiatry. By Louis S. London. Published by Corinthian Publications, Inc., New York. 98 pages. Price $2.00.

Dr. London's book, Dynamic Psychiatry, is quite condensed, including many of the important concepts that are popular in psychiatry at this time. As a book for the student and general practitioner who wishes to obtain a general view of psychodynamics, I recommend it highly. It is impossible to cover adequately the many concepts that are mentioned in this small book, but it does give the reader an opportunity to be introduced to many of the prominent men in the field of psychiatry, and their interpretations of personality structure. This book is an excellent text for medical students who have had a previous contact with psychology and elementary courses in psychiatry.—*E.E.B.*

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The 30th annual scientific and clinical session of the American Congress of Physical Medicine will be held at the Roosevelt Hotel, New York City, August 25-29. All sessions will be open to members of the medical profession in good standing with the A.M.A. Full information may be obtained from the American Congress of Physical Medicine, 30 North Michigan Avenue, Chicago 2, Illinois.

ABSTRACTS FROM CURRENT LITERATURE

Adrenal Insufficiency

Advances in the Diagnosis and Treatment of Adrenal Insufficiency. By George W. Thorn, Peter H. Forsham, Thomas F. Frawley, D. Lawrence Wilson, Albert E. Reynood, Donald S. Fredrickson and Dalton Jenkins, Am. Jnl. Med., 10:5, 595-611, May, 1951.

These authors emphasize the importance of the synthesis of the adrenal steroids in pure form in the treatment of insufficiency, as well as the importance of ACTH in the establishment of such insufficiency. They then discuss various laboratory and x-ray aids in the diagnosis of adrenal insufficiency.

1. Changes in adrenal morphology. Adrenal biopsies are impractical and unsatisfactory, except in the occasional case of adrenal insufficiency associated with carcinoma or androgenic hyperplasia of the adrenal cortex. Of 123 patients with adrenal insufficiency who had abdominal x-ray, 15 showed adrenal calcification. However, four other patients showed adrenal calcification and did not have adrenal insufficiency.

2. Changes in urinary steroid excretion. Excretion of so-called 11-oxysteroids is very low in adrenal insufficiency; 17-ketosteroid excretion is more easily measured; in adrenal insufficiency in women it approaches zero; in men, it may be reduced to 50 per cent or less.

3. Characteristic changes in the electroencephalogram. In Addison's disease, there is a decrease in the predominant frequency and short bursts of low frequency.

4. Changes in electrolyte balance. Serum sodium concentration below 136 m.E q. per L., associated with a serum Na/K ratio below 30 suggests adrenal cortical insufficiency. A salivary sodium: potassium ratio above 2.2 is found in some patients with Addison's disease.

5. Changes in carbohydrate metabolism. These are nonspecific and not diagnostic.

6. Hematologic changes. There is often a low total white count with increased lymphocyte percentage and normal to elevated number of circulating eosinophiles.

7. Robinson-Kepler-Power water test. This test demonstrates inability to show normal water diuresis.

8. Wilder test. Reaction of the adrenal cortex to stress is demonstrated by withdrawing salt from the diet and adding potassium.

9. Twenty-four-hour fast. After a 15-hour fast, blood sugars are measured every three hours for the balance of 24 hours. Exclusion of hypoglycemia rules out insufficiency of adrenal carbohydrate regulating factors.

10. Four-hour ACTH test. The circulating eosinophiles are measured four hours after injection of 25 mg. of ACTH. The majority of normals show a drop of 70 per cent. A group of Addison cases showed an average decrease of only seven per cent. Patients with panhypopituitarism showed an average decrease of 31 per cent.

11. Forty-eight-hour ACTH test. After an initial dose of 25 mg., 10 mg. is given every six hours for 48 hours. The eosinophile count is done four hours later. In normals, the fall averages 91 per cent. In patients with Addison's disease, the fall consistently fails to reach 50 per cent.

12. Intravenous ACTH test. Results similar to those described.

13. Four-hour epinephrine test. Results are similar to those with ACTH but are more variable and less dependable. Not to be used when ACTH is available.

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The following agents are available for treatment of Addison's disease.

1. Adrenal cortical extract. This is of low potency, but is suitable for any type of parenteral route, and the action is rapid and of short duration. Lipo-adrenal cortex is 10 times as active in carbohydrate-regulating activity as most aqueous extracts, but contains less of the salt-retaining factors.

2. Desoxycorticosterone acetate. This steroid has potent salt and water retaining capacities.

3. Cortisone acetate. This compound preserves carbohydrate stores. It is most effective when given by mouth.

4. Dehydrocorticosterone (compound A) and corticosterone (compound B) have been given to patients with Addison's disease. These influence salt retention and intermediary metabolism. It has been suggested that corticosterone might provide complete hormonal substitution in Addison's disease.

In treating the patient with Addison's disease, these authors advocate first careful screening for active tuberculosis. Frequent feedings may be necessary if hypoglycemia is troublesome. They start the patient on desoxycorticosterone intramuscularly, increasing the dose to early signs of excessive fluid retention. The dose is then decreased until weight ceases to increase. A further reduction of 0.5 mg. is made, and salt is added in the dose of 1.0 gm. three times a day. After observation and further dosage adjustment, DCA pellets are implanted, 125 mg. for each 0.5 mg. of DCA required daily by injection. These usually last eight to 10 months. After therapy is well established, cortisone is added in doses of 12.5 mg. twice a day.

In the presence of infection, the patient with Addison's disease should be schooled to take additional cortisone.

Addisonian crisis is treated by large doses of DCA and cortisone intramuscularly, adrenal cortical extract intravenously, blood transfusion or human albumin, and intravenous salt and glucose.

Results with cortisone have been gratifying, chiefly increased appetite, weight, muscular strength and aggressiveness. Hair growth is increased and pigmentation decreases. The slowed electroencephalogram returns gradually to normal.—*E.J.R.*

* * *

Agenesis of the Vermiform Appendix

Agenesis of the Vermiform Appendix. By Donald C. Collins, Am. Jnl. Surg., 82:6, 689-696, Dec., 1951.

Congenital absence of the human vermiform appendix is rarely encountered. The author reviews the literature and adds three cases observed by himself.

Embryologically, the vermiform appendix is seen as a vestigial structure. All carnivora possess some type of cecal appendix, but only in man and the anthropoid apes does it occur as a vermiform structure. It represent only the undilated portion of the true distal apex of the adult cecum. "Therefore, no mysterious nor mystical endocrine functions may be correctly attributed to the human appendix."

Dr. Max Thorek is quoted as saying, "While some authors maintain that an appendix may be absent, in several thousand appendix operations I have always been successful in locating it," thus emphasizing the rarity of the condition.

Anomalies of this region include: 1. Failure of development of cecal anlage; 2. Partial development of cecal anlage; 3. Full development of cecal anlage, no development of appendiceal anlage; 4. Full development of cecal anlage, early cessation of appendiceal anlage; 5. Full development of cecal anlage, failure of the appendiceal anlage to become differentiated, its growth keeping up with that of adult cecal portion.

This group represents a total of 74 cases in the literature, out of which appendiceal agenesis occurred in 60, and which includes the three cases reported by the author—one of which was surgical and two were autopsies.

The bibliography includes reference to 87 articles on the subject.—*T.P.B.*

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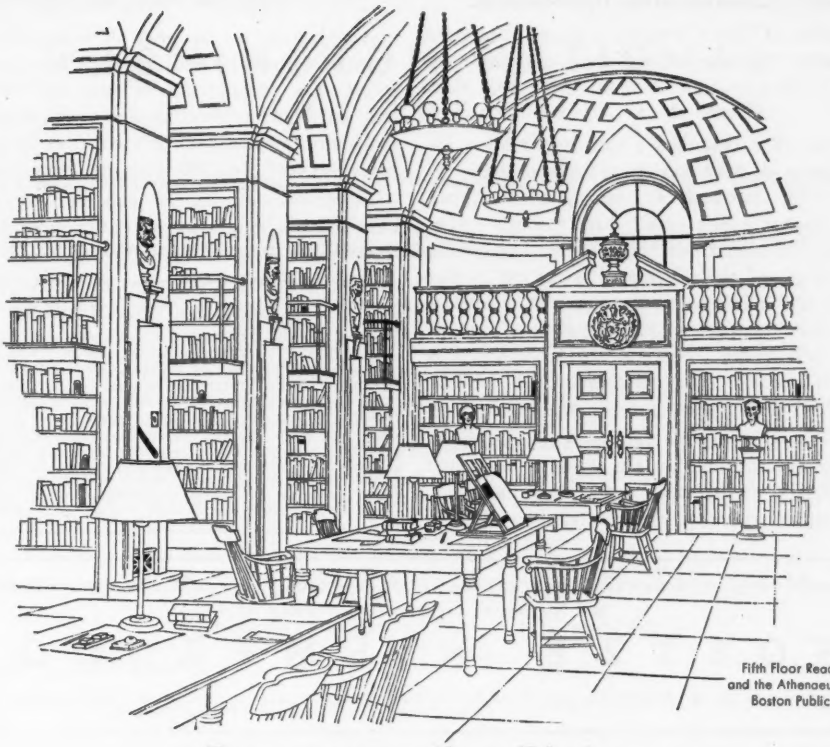

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Infantile Communicating Hydrocephalus

Evaluation of "Seton" Procedure in the Treatment of Infantile Communicating Hydrocephalus. By Hendrik J. Svien et al, Jnl. Ped., 40:3, 298-302, Mar., 1952.

Hiller in 1933 described a simple procedure for the treatment of communicating hydrocephalus in infants which consisted of inserting a silk thread into the lumbar subarachnoid space through a specially designed spinal puncture needle. The needle is withdrawn and the silk thread is cut off so that the outer end is just below the skin. This leaves a tract for the flow of the cerebrospinal fluid into the adjacent soft tissue. The authors employed this method in 24 cases. Nine cases seemed to have had their hydrocephalus arrested.

The authors admit the results in the cases reported are not striking, but are of the opinion that they represent considerable more than the spontaneous remission rate would account for.—*D.R.D.*

Penicillin Prices Reduced

A reduction in the price of penicillin was announced recently by Eli Lilly and Company, Indianapolis. The average rate of reduction was 25 per cent, attributed by the company to improvements in production methods. Little more than 10 years ago, penicillin cost about 80 times the price today.

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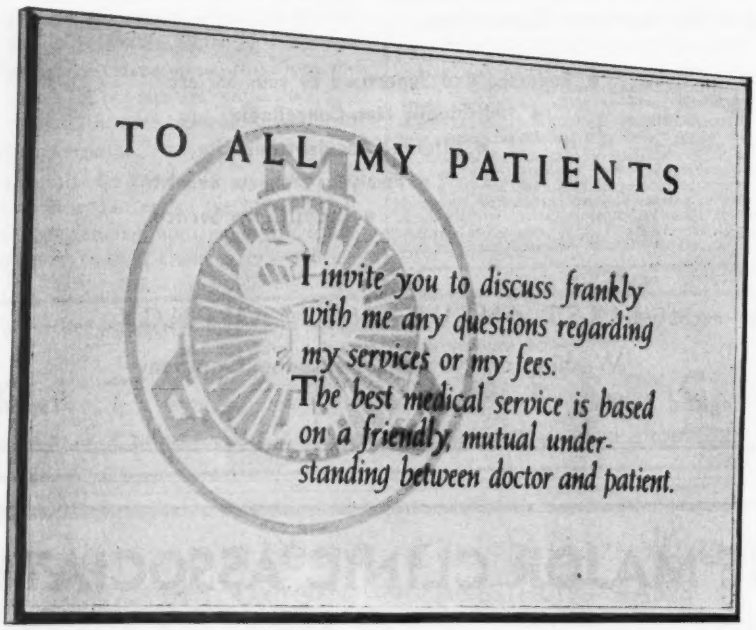
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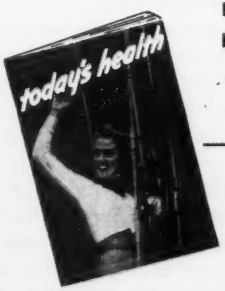

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Vahlquist, B. and Hackzell, G.: Acta Paediatrica *38*: 622 (1949).

NO. OF CASES	SEX	AGE AT ONSET	CYCLIC VOMITING	DURATION OF ATTACK	INTENSITY
31	8 ♀ 23 ♂	3 yrs. (mean)	3 out of 31	2½ hrs.	severe in all cases

TABLE CONT'D

NO. OF CASES	UNILATERAL HEADACHE	NAUSEA	FLIMMER SCOTOMA	VERTIGO	HEREDITY
31	18 out of 31	31 out of 31	12 out of 31	6 out of 31	20 out of 31

(reference given above)

In a study of 400 adult migraine patients, it was revealed that 34% had suffered attacks before the age of 15.* These investigators concluded that childhood migraine was a much greater clinical problem than was previously believed and that psychodynamic mechanisms played an important part in the disease.

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*Katz, J., Friedman, A.P., and Gisolfi, A.: New York State J. Med. *50*: 2269 (Oct.) 1950.

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Low Death Rate in 1951

The battle for public health progressed markedly during 1951, when the lowest death rate in the nation's history was recorded, according to a recent release from the Federal Security Agency.

State public health programs placed increased emphasis during the year on the prevention and control of chronic diseases, with particular attention to cancer and heart disease. In some areas activities were directed toward problems of diabetes, arthritis and rheumatism.

Research in chronic disease kept pace with the expansion of control measures, the Surgeon General states. Investigations in heart disease centered around the major problems of rheumatic fever, hardening of the arteries and high blood pressure. Progress also is reported in cancer research, mental health research and dental research.

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